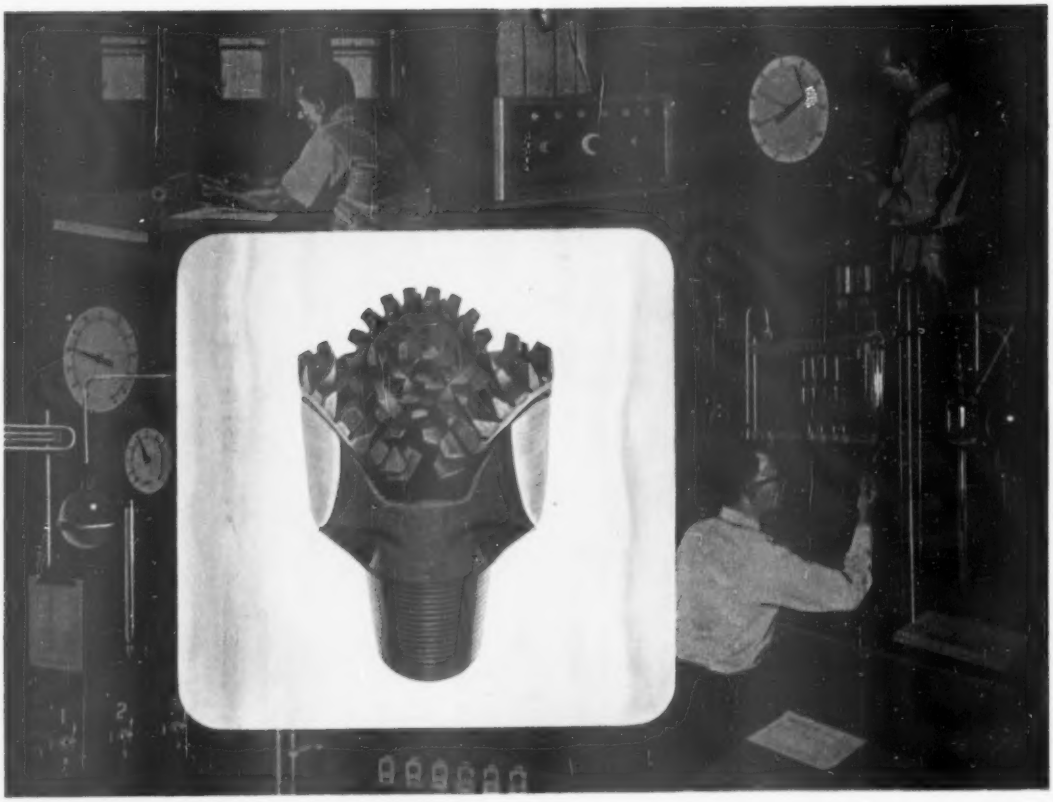
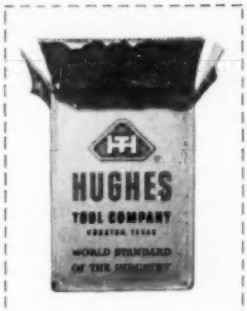
the OIL AND GAS JOURNAL



Controlled heat treating puts "muscle" in your bits

The metallurgical "muscle" and stamina that keep your rock bits biting into the formation longer come from accurately controlled carburizing and heat treating.

In perfecting these operations Hughes Tool Company has developed the industry's most advanced heat treating processes and equipment. *Today, Hughes ranks as the largest deep case carburizer of manufactured products in the world.* Back of every Hughes bit you run is the Company's 45 years' experience in making the industry's finest rock bits.



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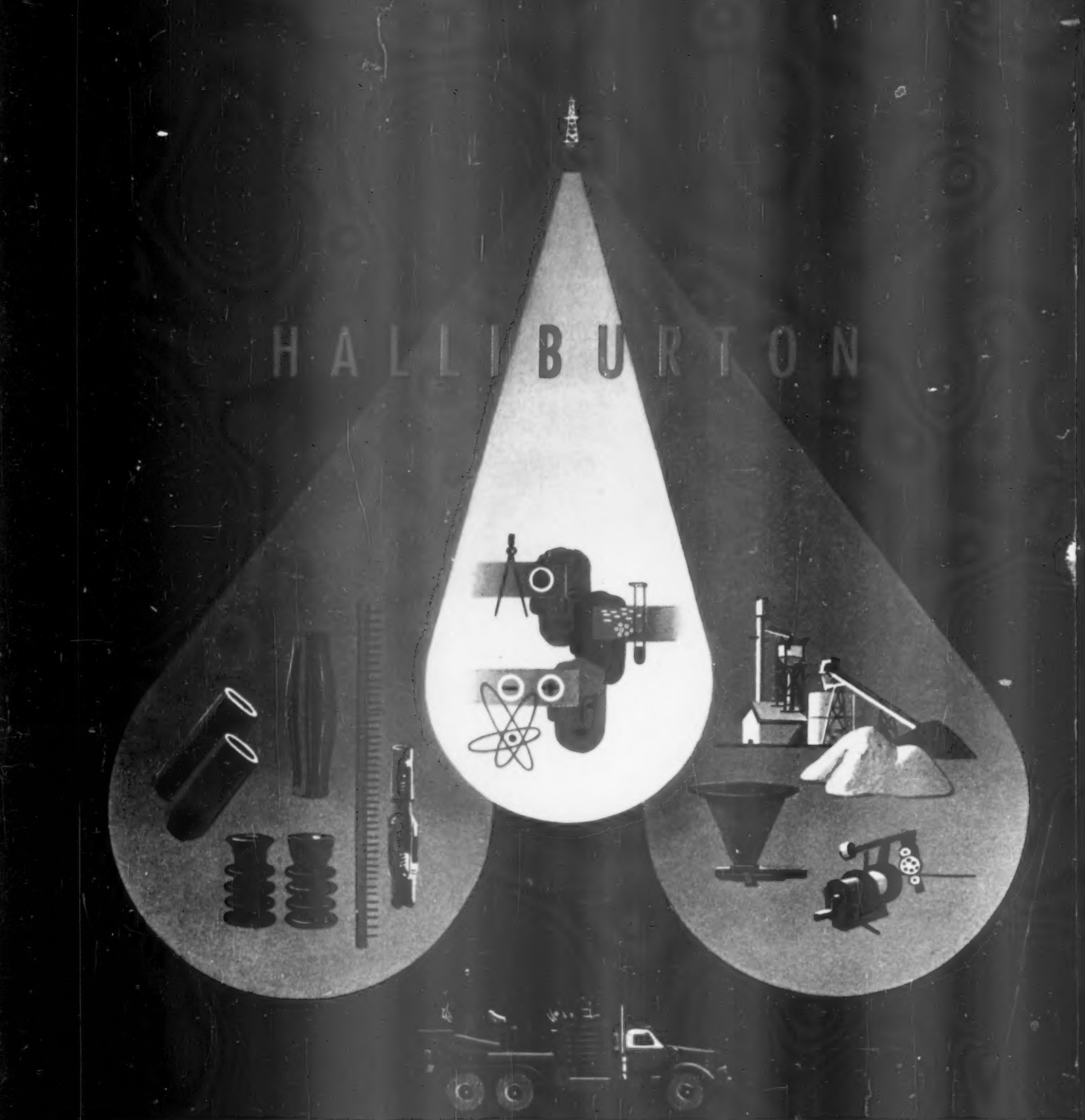

CEMENTING *doesn't come in sacks*

It wasn't a simple procedure even in posthole days. But now cementing an average well takes in many things . . . highly specialized tools, powerful pumping equipment, electronic recording devices, advanced technology . . . things you don't put in sacks. Yet, complex as it has become, modern cementing is more and more successful in increasing the production of oil. Halliburton has made it so. Practically all the improvements were made by Halliburton, or in close cooperation with other companies. Only Halliburton has concentrated 25 years research on improving its service. Only Halliburton has the experience of performing over a million jobs. So, it's only natural that Halliburton leads all the way in the science of oil well cementing – a science that doesn't come in sacks.

HALLIBURTON OIL WELL CEMENTING COMPANY

THERE'S NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING

DUNCAN, OKLAHOMA

the OIL AND GAS JOURNAL

JANUARY 4, 1954 VOL. 52 NO. 35

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In Brief . . .

1. NEW FLOOD PROJECT . . . A small water-injection project has recently been started in the Long Beach Harbor area of California's Wilmington field. The flood is located on properties owned by the city of Long Beach and operated by Long Beach Oil Development Co. It involves a three-well subpool, with water injection via two input wells. If the flood results in increased oil recovery and proves that reservoir pressures can be maintained, large-scale projects in other Wilmington fault blocks and zones are expected to follow. Ocean water, obtained from a shallow well to take advantage of the natural filtration provided, is used as the injection fluid.

2. PETROCHEMICAL FLEXIBILITY . . . The Platformer-Udex facilities at the Big Spring refinery of Cosden Petroleum Corp. are used for production of high-purity benzene, toluene, and xylene. This is the first instance of such simultaneous production of these materials, from a petroleum source.

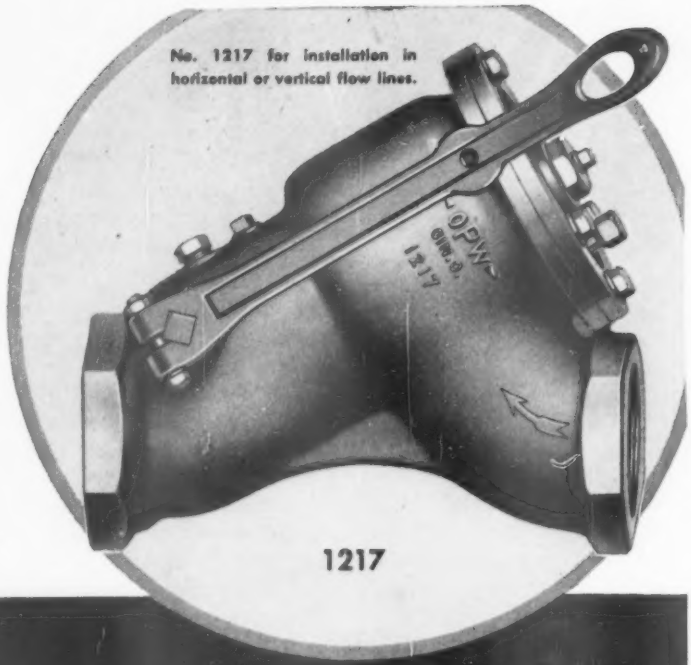
In operation since September 1952, the aromatics units have proved economical at average charge rate to Platformer of 3,000 bbl. per day. Over 2,000 bbl. per day of aromatic platformate is charged continuously to Udex unit. Recovery is 94.5 per cent of total aromatics in Udex charge. Over 900 bbl. per day of highly pure products are separated by continuous distillation in three-column superfractionation train without separate rerun. The installation has high flexibility in blocked-out Platformer operation for aromatics and high-octane motor-fuel manufacture.

3. CAT CRACKER OPERATION . . . Cat cracker performance depends on a number of important interdependent operating variables. A better understanding of these variables will in many cases show how the cat cracker can be operated at increased capacity and/or increased yields. Extent of conversion is the first of these variables discussed in this continuing series. Relationships showing effect of extent of conversion on yields are presented.

4. CLEANER GAS . . . The dirt-removal problem in gas pipe lines may be expected sooner or later, in spite of gas treating. Iron oxide and/or sulfide particles flake off the pipe wall and are carried along with the gas stream. To properly clean pipe-line gas, gas-cleaning equipment should be placed at some 10 different locations between the well and the consumer.

If Shock Can Be Overcome

THIS VALVE WILL DO IT!



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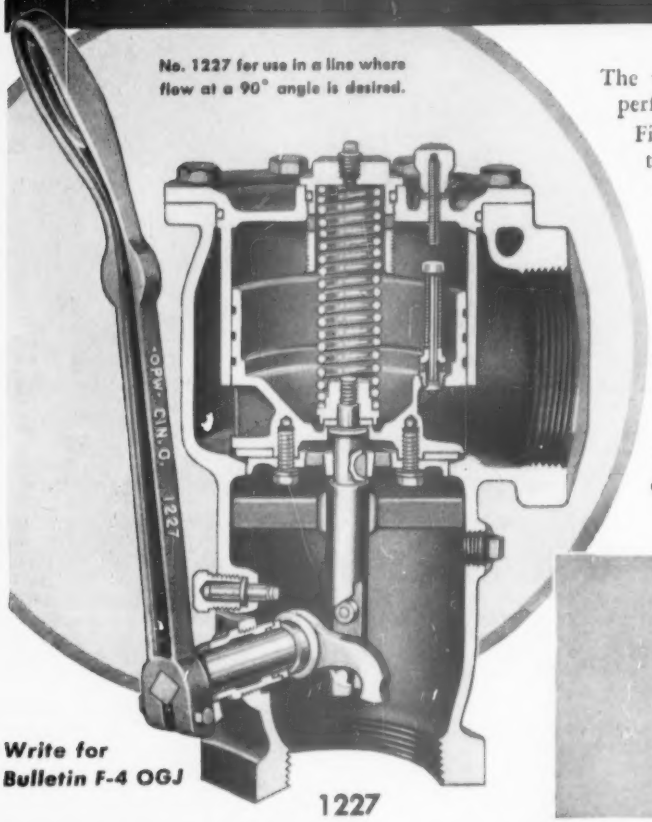
OPW BALANCED PRESSURE TYPE LOADING VALVES



1227

The valve you're using . . . . . how smoothly does it perform when really put to the pressure test?

First of all, you want a valve to give full protection to pumps, meters, strainers and pipe lines—one that eliminates "line hammer" damage.

. . . . . a valve that has positive Flow Range Control that can be quickly adjusted to meet any low gravity to high pressure condition. Easy Opening! Fast Topping Off! Minimum Afterflow!

. . . . . a really *smooth, shockless operation* without the use of surge chambers on long discharge lines.

. . . . . and last but not least, construction and integral working parts that won't let you down!

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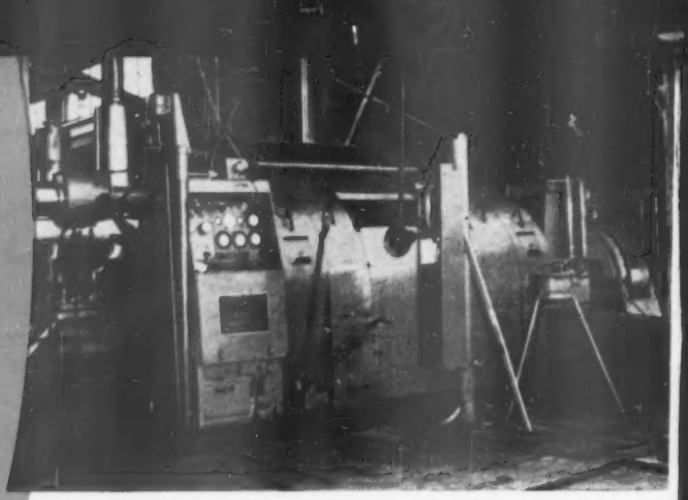
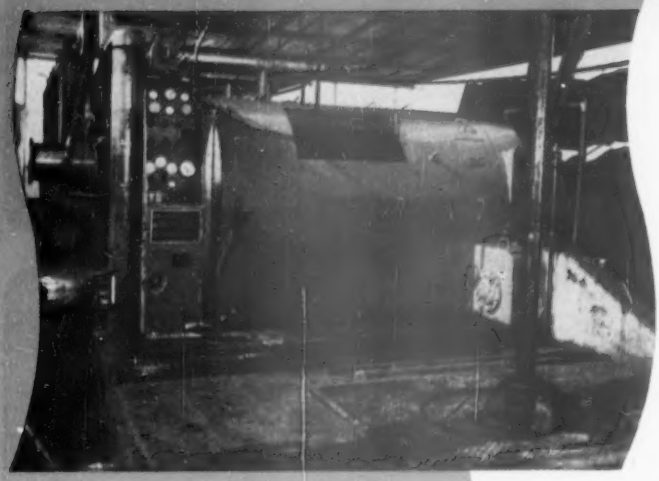
are setting OUTSTANDING Performance Standards

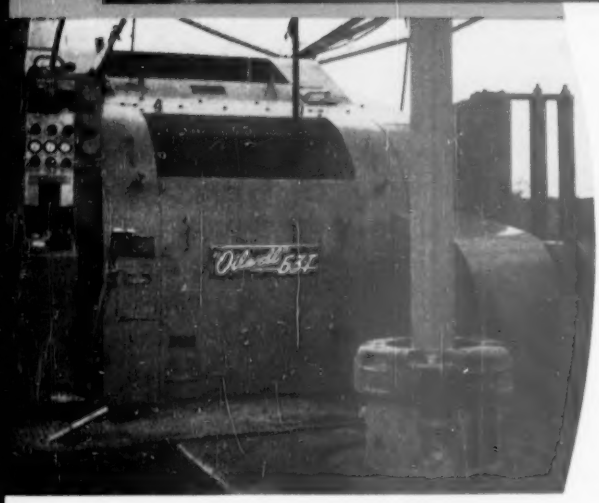




The No. 96

—for DEEP-Well Drilling

This fully-unitized rig with its responsive air controls is designed to drill 15,000 feet with 4½" drill pipe—and deeper with 3½". Three or four engine drives provide two pump take-offs. Companion "Oilwell" equipment—No. 580 Crown Blocks, No. 480 Traveling Blocks, No. S6-400 Swivels, No. 26-HD Rotaries and No. 220-P Pumps.



The No. 76

—for MEDIUM-DEEP Drilling

This compact rig with its unitized assemblies and simplified air controls provides economical drilling to 10,000 feet with 4½" drill pipe; exceeding the range of most competitive models of comparable size and weight. Compound drive can be furnished with two or three engines and take-offs for either one or two pumps. Companion "Oilwell" equipment—No. 360 Crown Blocks, No. 300 Traveling Blocks, No. S5-200 Swivels, 20½" Rotaries and No. 214-P or No. 218-P Pumps.

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—for MEDIUM Drilling Depths

This extremely compact rig is rated for drilling to 7,500 feet with 4½" drill pipe and can be transported intact with two or three engine drive. It is equipped with air controls and built-in Hydromatic Brake and can be furnished with standard mechanical drive or with torque-convertor drive. Companion "Oilwell" equipment—No. 250 Crown Blocks, 66-in. Traveling Blocks, No. S4-100 Swivels, No. 17½-C or D Rotaries and No. 212-P or No. 214-P Pumps.

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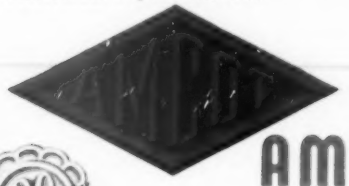

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SUITABILITY:	Best for the job
FEATURES:	Outstanding Exelloy trim
MAINTENANCE COST:	Routine care only
SERVICE LIFE:	Good as new — after more than 2 yrs.
OPERATING RESULT:	No production lost to valve trouble
AVAILABILITY:	Regular Catalog item — No. 47X

THE CASE HISTORY

The steel valves originally installed here were hindering maximum wax production. The chilling cycle was slow—rejects for remelting were high. The trouble was that the shutoff valves were leaking, and hot wax was getting into the presses during the chilling cycle. Yet the valves were comparatively new.

There's been no such trouble since Crane No. 47X, 150-Pound Gates were installed more than 2 years ago. Their Crane Exelloy trim, suited for temperatures up to 1000 deg. F. keeps giving a tight shutoff on the hot wax, month after month, with easy operation. And they've done so with but routine attention, ever since installed. Better quality is always the bigger value, as every thrifty valve buyer knows.

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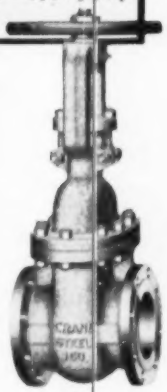

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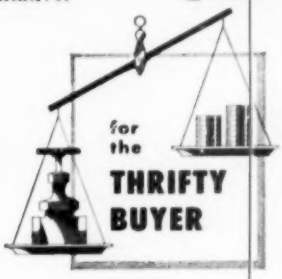

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Major Advance in
Tractor Design!

New Caterpillar oil-type flywheel clutch

now standard in the D8, D7 and D6!

Once again Caterpillar leads the field in an advance that boosts production, cuts down time and lowers operating costs. The new oil-type flywheel clutch, now standard in the Cat* D8, D7 and D6 Tractors, means a new high in money-making performance for you from these three rugged machines. Exhaustive on-the-job tests prove that this clutch lasts many times longer than other clutches under *identical* conditions. They also prove it enables you to run these tractors two to four times longer before making clutch adjustments.

Here's how it works. The oil system is entirely separate from that of the engine. While the engine is running, the oil pressure flows to all working parts of the clutch. Oil is fed constantly through the radial and circumferential grooves in the friction discs even when the clutch is engaged, thus cooling the friction discs and pressure plates at all times. As a result, there's minimum opportunity for wear and heating to take place. That's why adjustments are very seldom needed and disc replacement normally required no more often than engine overhauls. For easy access, the clutch has a dirt-proof housing with a big opening at the top—a mechanic doesn't have to disturb engine or transmission to get at it.

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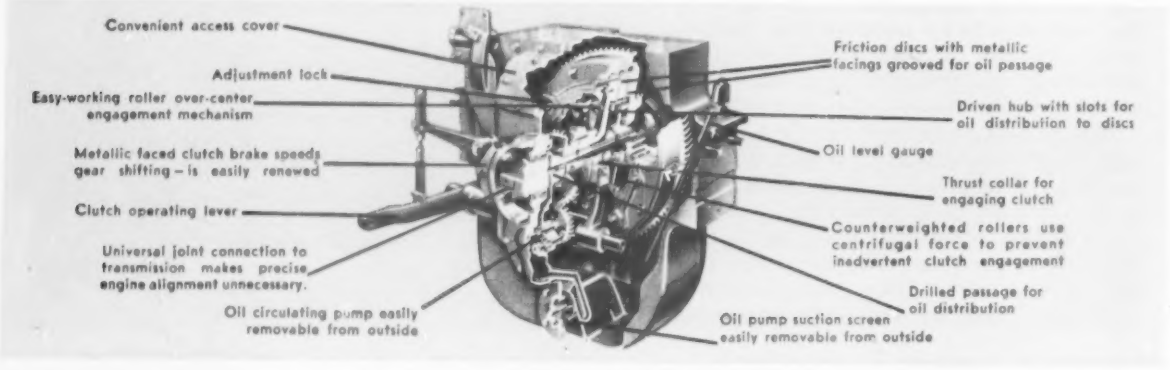
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Drilled passage for oil distribution
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New Caterpillar oil-type flywheel clutch gives you greater dependability and lower service and maintenance costs than any other clutch under identical conditions, normal or tough.

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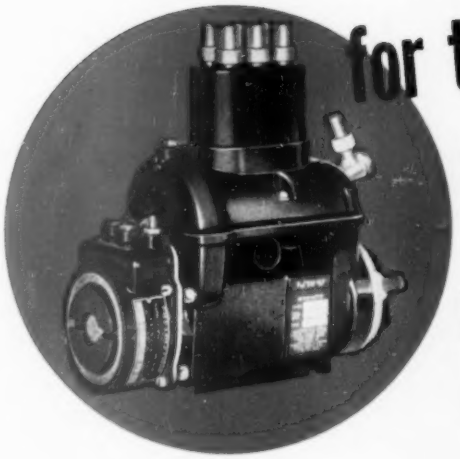
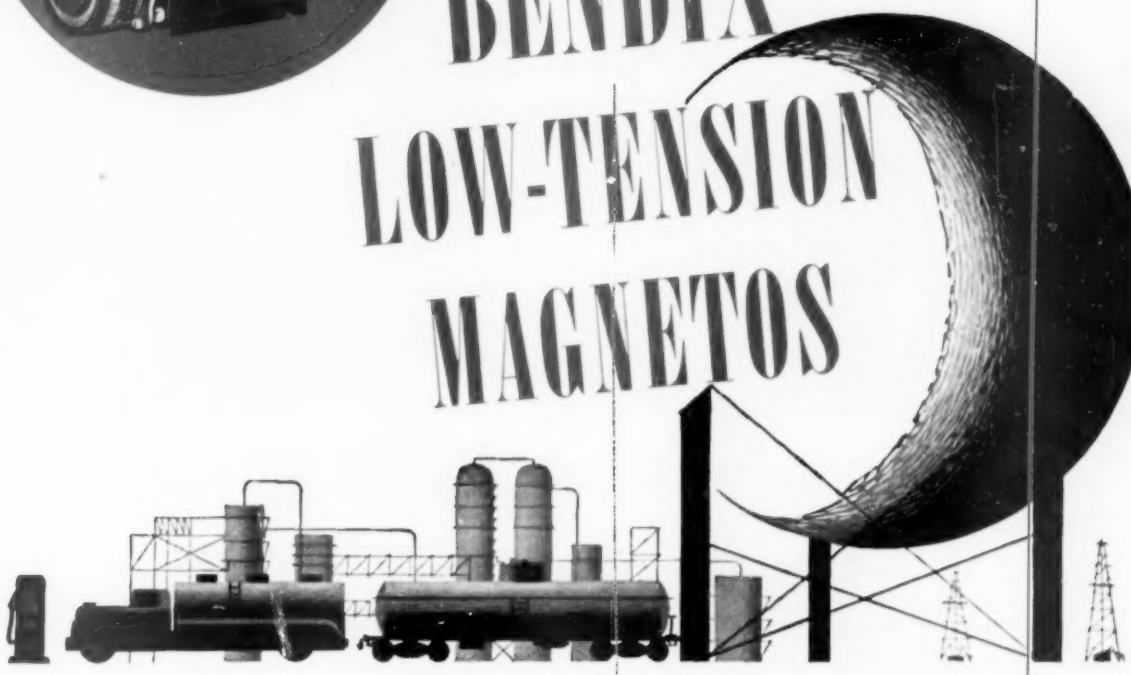
Designed for the Petroleum Industry—



BENDIX LOW-TENSION MAGNETOS



It's the magneto designed to eliminate fire hazard, foremost problem of the petroleum industry. The special ventilating arrangement of the Bendix Low-Tension Magneto permits air laden with explosive fumes to enter the magneto for ventilation without danger of igniting the surrounding air. Kits are also available to convert magnetos now in use to the "flame-proof" ventilation type.

In addition to this important safety feature, Bendix Low-Tension Magnetos actually reduce engine maintenance and operating costs. For example, spark plug erosion is reduced to a minimum. The distribution of low-tension voltage to the high-tension coils is through a series of breaker assemblies, thus eliminating trouble often experienced with the conventional distributor. Variable or fixed sparks can be obtained by internal adjustment.

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Send today for complete information on CARLON Plastic Pipe for oil country piping.

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For these reasons, leading service organizations everywhere are consistent users of Du Pont Jets. So whenever you require the services of one of these prominent companies (see list below) . . . be sure to follow the lead of major producers by specifying that the job be done with Du Pont Jet Perforators. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

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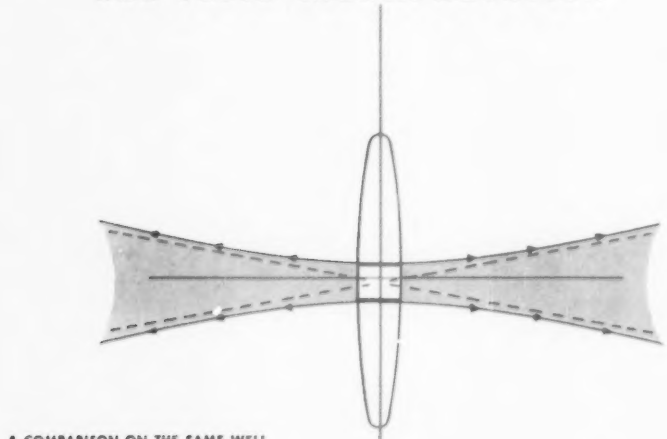
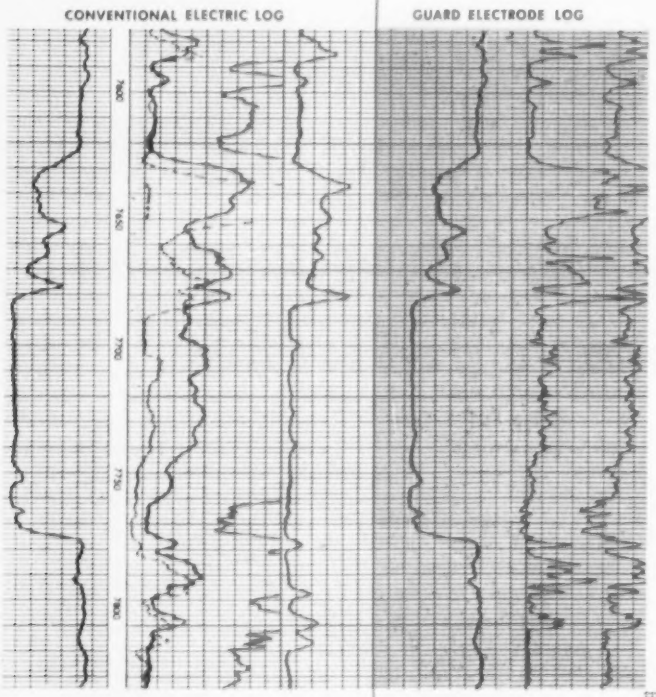
...THROUGH CHEMISTRY

HOW GUARD LOGS IMPROVE CORRELATION and FLUID INTERPRETATION



A COMPARISON ON THE SAME WELL



The growing importance of well logging in drilling operations is causing geologists to take a fresh look at logging methods available to them.

Particular attention is being paid to the Guard Log. Geologists find it provides them with solid advantages over conventional logs in improved correlation and fluid interpretation.

For one, averaging effects are absent in Guard Electrode curves, permitting them to represent lithologic conditions more closely. And core records parallel Guard Log findings.

Another advantage of Guard Electrode is that its controlled current path allows resistivity measurements in beds of critical thickness and in extremely saline fluids. In addition, the Guard has no spacing effect. Removal of this variable eliminates shadow, lag, plateaus, and detrimental anomalies that occur in conventional electric logs.

Guard Electrode may be mighty important on your next logging job. Phone your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

ELECTRICAL WELL SERVICES

PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

First ALL NEW Pipe insulation in 60 years

flexible glass fiber insulation . . .

resilient, snaps on . . .

insoluble in water . . .

4 to 10 times lighter . . .

clean and pleasant to handle . . .

easy to cut with a knife . . .

won't break or crumble . . .

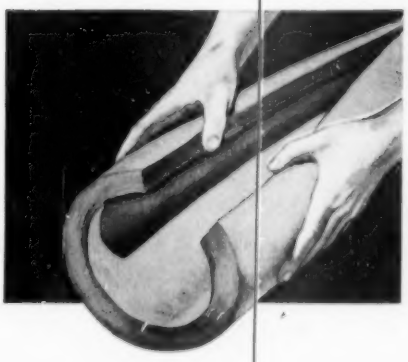
superior in thermal efficiency . . .

easy to finish . . .

G-B Ultrafine pipe insulation is a new one-piece molded pipe insulation of fine glass fibers. In every sense, it is the first all-new pipe insulation since the turn of the century—ideal for hot or cold lines, for plant maintenance or new construction.

To the many advantages you see illustrated here that make it far easier to ship, stock, and apply, you can add *economy*. For this new pipe insulation *costs no more* than other insulations—and actual applications reflect *savings up to 50%!*

Seeing is believing. Write today and you will receive samples and complete information by return mail.



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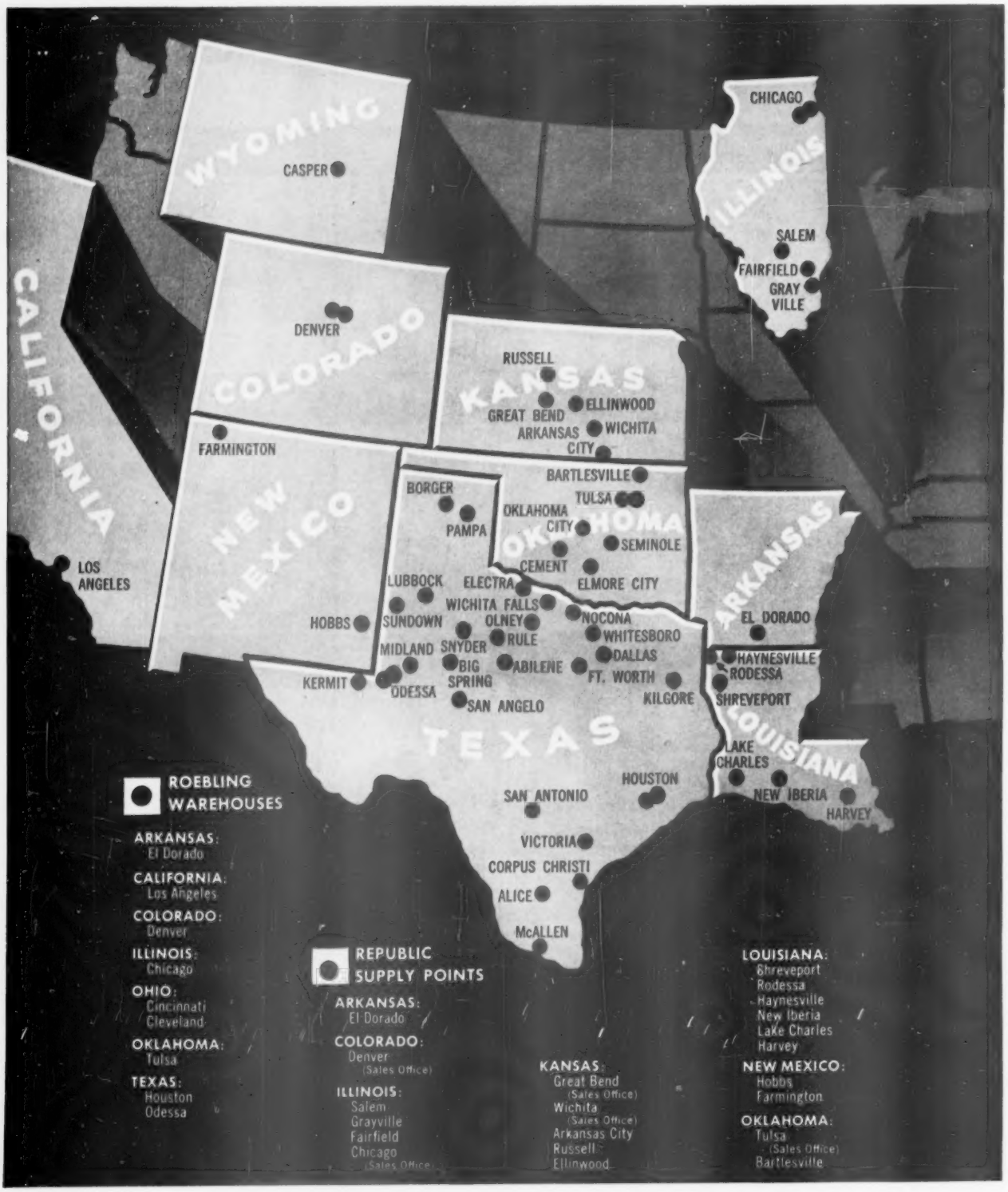
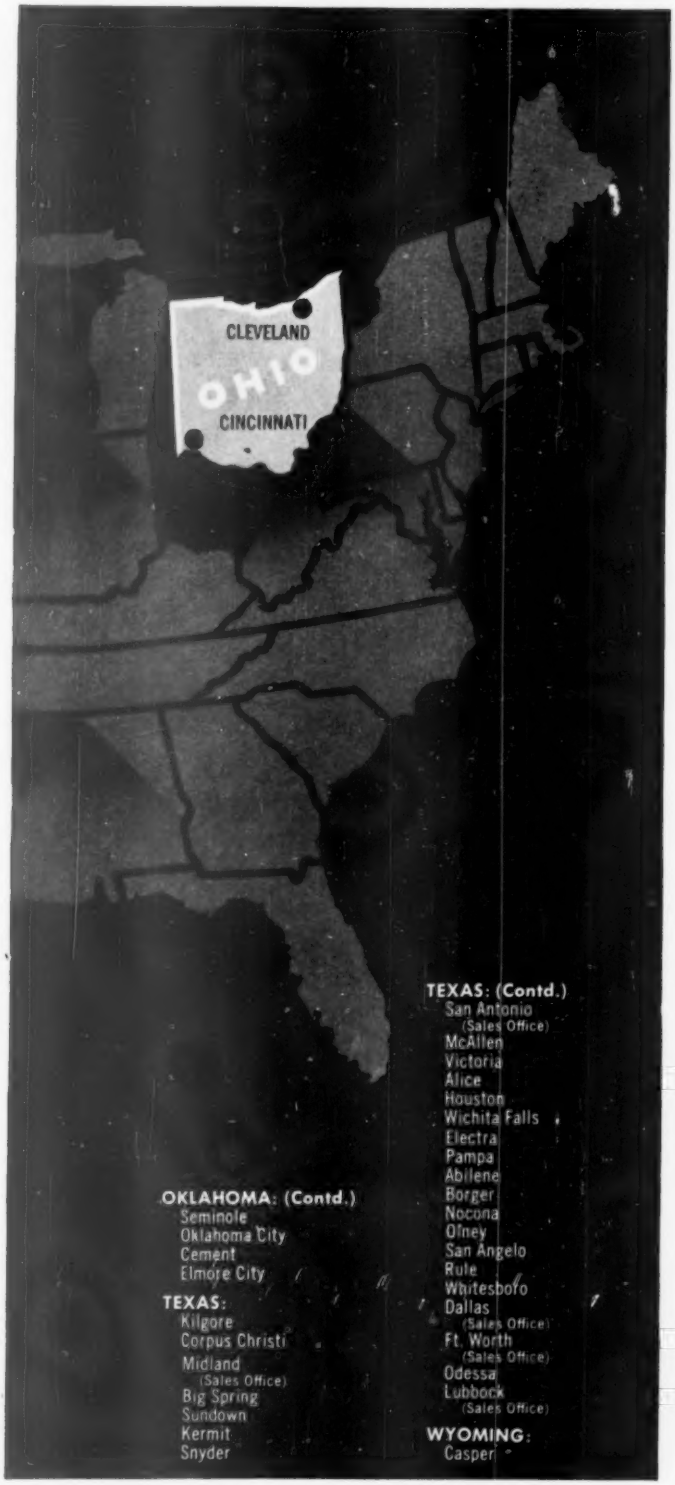


...WHEN YOU WANT IT!



Here's where to get your Roebling Wire Rope

NO MATTER where you're located, there's a Roebling warehouse or a Republic supply point near at hand to give you quick deliveries and beneficial service.

Both Roebling and Republic Supply Company field men are qualified to help in selecting the right wire rope for every purpose. As you know, ropes in the oil fields are subjected to varying degrees of stress, abrasion, heat, bending, crushing or corrosion. There's always a Roebling rope with proper resistance to every combination of these destructive forces, and the selection of *that* rope is your one assurance of longest life on the job and dollar savings that really count.

JOHN A. ROEBLING'S SONS CORPORATION
TRENTON 2, NEW JERSEY

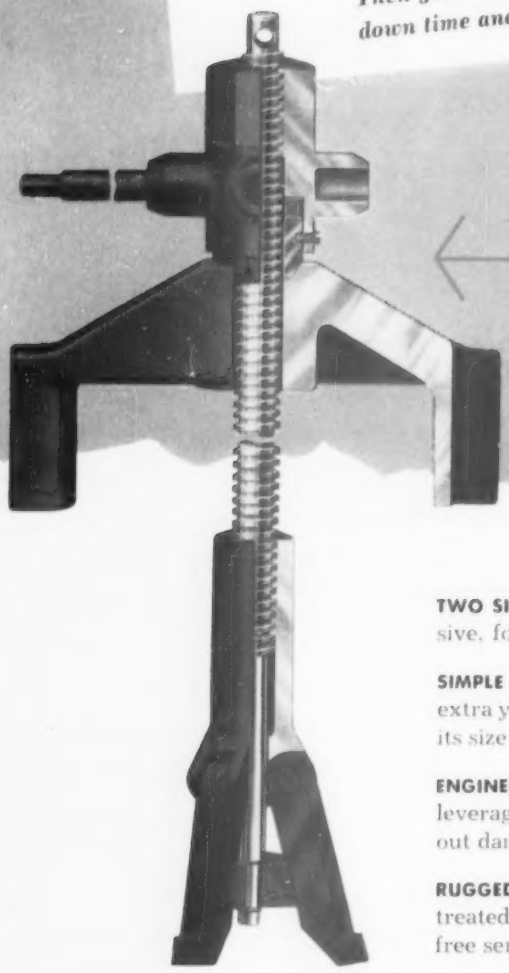
ROEBLING

SUBSIDIARY OF THE COLORADO FUEL AND IRON CORPORATION

Spending hours on simple liner changes?
Torch-cutting the stubborn ones?
Damaging bores on re-usable liners?

Then get this Grant Liner Puller and save pump down time and equipment on every rig!

THIS IS THE PULLER THAT PULLS THE LINERS THAT "CAN'T BE PULLED" IT'S THE GRANT!



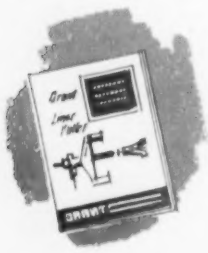
TWO SIZES cover the range from 3½" to 9" liners inclusive, for *all* pumps in which removable liners are used.

SIMPLE DESIGN eliminates all unnecessary parts such as extra yokes, extra heads and adapters. Each puller covers its size range *without change.*

ENGINEERED for fast, easy operation, and with tremendous leverage needed to pull "frozen" liners safely and without damaging the liner bore or pump.

RUGGEDLY BUILT of quality alloy steels, and correctly heat treated to give maximum strength and years of trouble-free service.

Remember: **when it comes to pulling tough liners, you can't do better than with Grant. It's the handiest tool you can have for getting the job done right — *and fast!***



If you have not received your copy of Bulletin 14 on Grant Liner Pullers, write for it today. No obligation, of course!

GRANT
OIL TOOL COMPANY
Main Office & Plant
3042 S. Vernon Ave., Los Angeles 58, California
California—Ventura—Phone Main 3-6767 • Avenal—Phone 225
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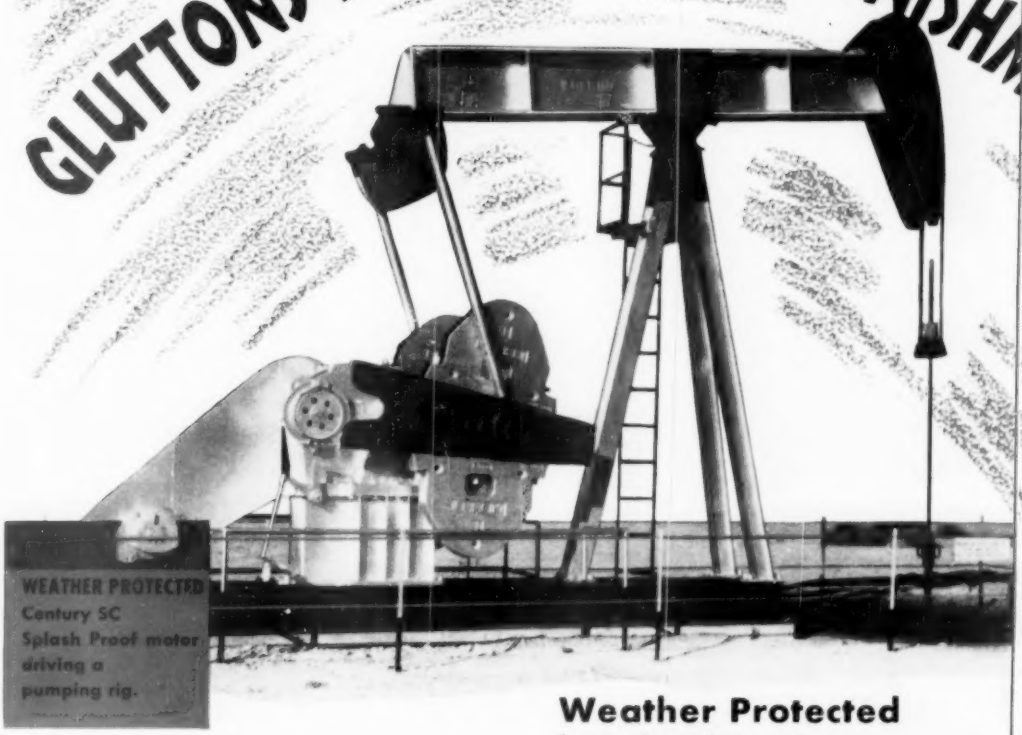
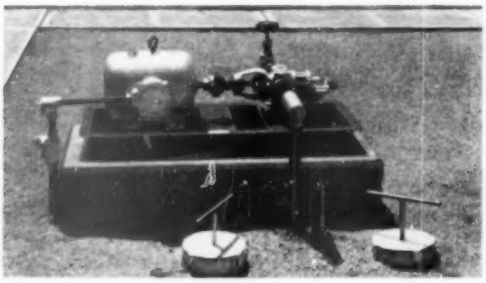
GLUTTONS FOR PUMPING PUNISHMENT



WEATHER PROTECTED
Century SC
Splash Proof motor
driving a
pumping rig.

DEPENDABLE Century MOTORS



UNDERWRITERS' APPROVED Century Explosion Proof motor driving a pipeline station sump pump.

Weather Protected
for steady outdoor service

Explosion Proof
for safety in refining and distribution

The extra ruggedness built into every Century motor is your protection against unforeseen operating conditions.

Century motors are built to stand up under unusual demands. In addition, they'll serve you better because you can fit each job with a Century motor that's just right for it. There is a Century motor engineered for every popular need in oil production, refining and distribution.

For further information on Century motors for your pumping rigs, water pumps, air compressors, mud screens, fans and blowers, ask at your supply store.

Century C MOTORS

CENTURY ELECTRIC CO.
1806 Pine St. • St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

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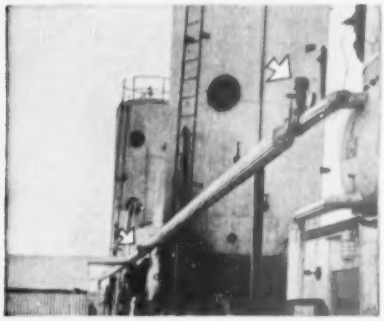
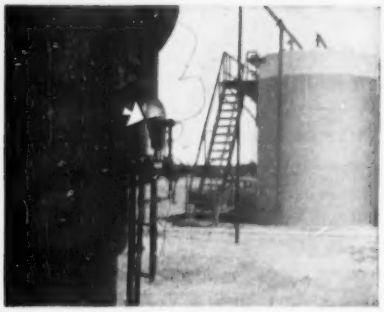
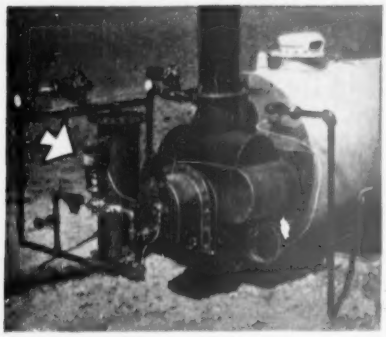


USED BY LEADERS IN THE INDUSTRY





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from Oil Field Production Equipment

Install POWERS

No. 11-OFT Self-Operating Temperature Regulator

✓ Check these features that give Economical Trouble-free Performance — in all kinds of weather

1) Thermal system has OVER-heat protection. Powerful two-ply bellows and single seat composition disc valve assures tight shut off.

2) Valve stem lubricator helps give closer control, reduces packing gland troubles.

3) Rugged, built for long reliable service in all kinds of weather. Operate efficiently down to 60° F. below zero.

4) Durable Valves are direct acting, have single seat bronze body with double unions, for easy installation, composition disc and stainless steel seat.

5) Temperature adjustment range: 110 to 190° F., other ranges between 30 to 370° F.

6) Bulb Well is cadmium plated steel and extra heavy plain capillary tubing is 10 ft. long.

Powers No. 11 Regulators are backed by over 60 years experience making *SELF-OPERATING* controls. They are used by leading manufacturers of heaters and treaters.

Simplify Your Control Problems—Standardize on Powers

[b47]

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OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

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Unless you already use OXWELD rods, chances are you can reduce your welding costs and also get better results than you are getting now. Why? Because OXWELD welding rods are especially engineered to save you money under actual working conditions in your own shop.

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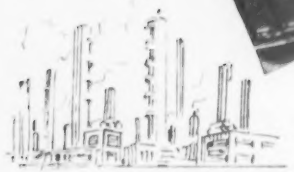
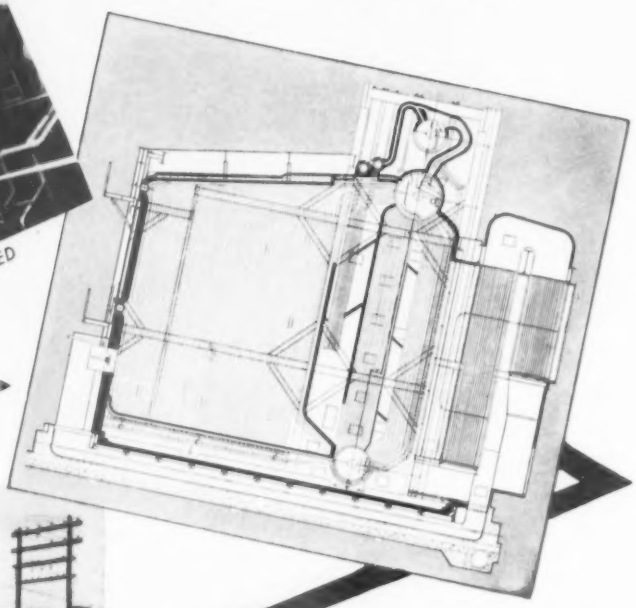
STEAM GENERATOR

Gives Top Performance in a Leading Texas Petroleum Refinery

VIEW OF THE COMPLETED STEAM GENERATOR



RIGHT →
LONGITUDINAL SECTION THROUGH THE UNIT.



6'-6" DIAMETER x 37'-0" LONG STEAM DRUM BEING TRANSPORTED TO THE ERECTION SITE DURING INSTALLATION.

PRINCIPAL DATA

400,000 pounds per hour capacity.

Fusion welded steam and water drums designed for 700 lbs. S.W.P.

Superheater delivers steam at 750°F. total temperature.

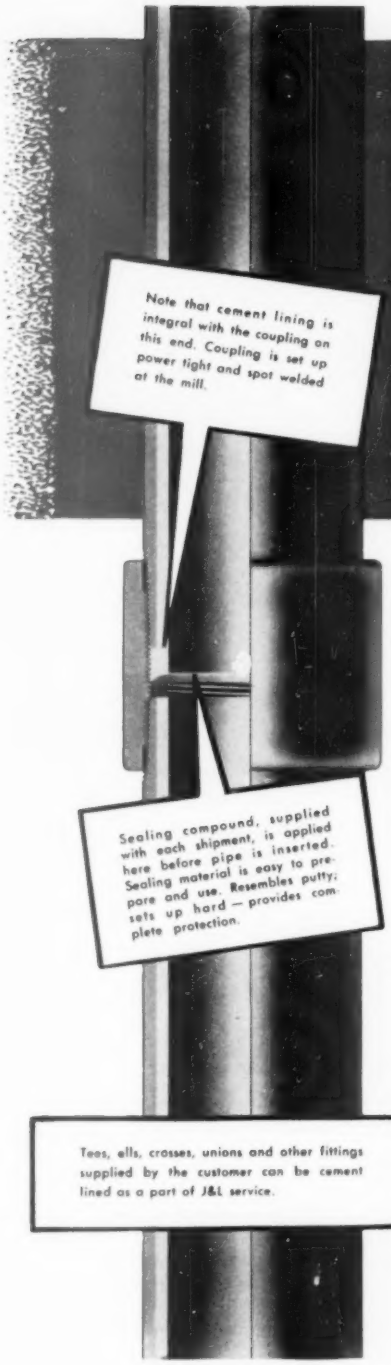
Water cooled furnace.

Burners for Oil and Acid Sludge fuel.

Vogt builds a complete line of bent tube steam generators designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Write for bulletins.

HENRY VOGT MACHINE CO., LOUISVILLE 10, KY.

BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.


Note that cement lining is integral with the coupling on this end. Coupling is set up power tight and spot welded at the mill.
Sealing compound, supplied with each shipment, is applied here before pipe is inserted. Sealing material is easy to prepare and use. Resembles putty; sets up hard — provides complete protection.
Tees, ells, crosses, unions and other fittings supplied by the customer can be cement lined as a part of J&L service.

SALT WATER
SULPHUR WATER
ACID
CAUSTIC ALKALI
RUST
TUBERCULATION

....these things do not attack

J&L CEMENT LINED STEEL PIPE

J&L CEMENT LINED Casing, Tubing and Line Pipe combine the strength and economy of steel with a satin-smooth inner cement surface impervious to corrosive liquids.

This pipe is easy to install — no special skill required — and may be made up and broken down as often as necessary with no damage to the lining.

ASK FOR DETAILS—CALL YOUR J&L NUMBER OR WRITE US AT TULSA

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"I'm always fighting down-time . . . . . and my best weapon is U. S. Royal 4,"

says "Red" Royal

"I've got better use for my boss' dough," says Red, "than tying it up in extra equipment and standby hose. I'm fed up with switching, lubrication and down-time because of hose. For me, I'll take U. S. Royal 4 Rotary Hose—it can take drilling pressure of today's pumps and *handle every job all the way from spud to pay.*"

"Red" is right on the button. Another reason why he likes Royal 4 is because it comes shipped in a special crate—a mighty convenient container when you're moving from rig to rig.

Developed by Science—
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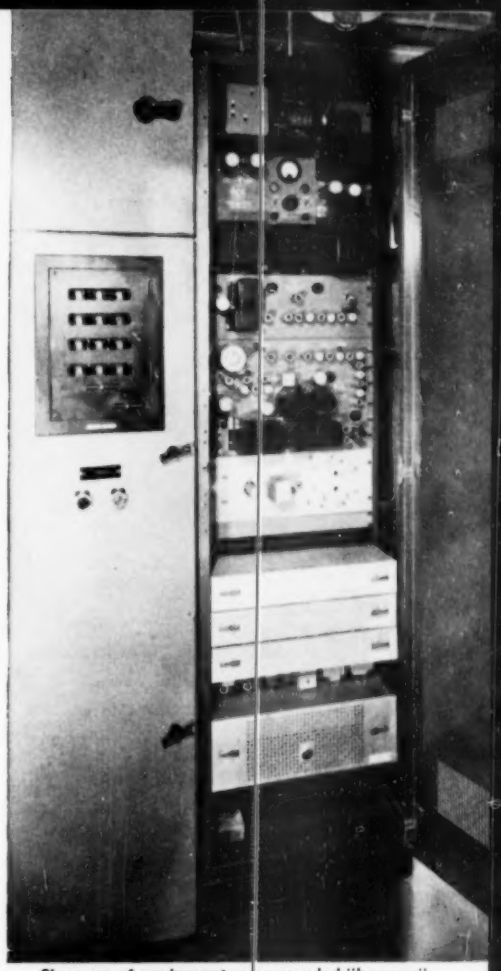
Available in all FIELDS at SUPPLY STORES

PRODUCT OF U.S.RUBBER SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Unattended "booster" stations—interspaced with regular pumping stations—increase pipe line capacity 25%



Close-up of equipment at unattended "booster" station. Cabinet open at right displays 960-mc RCA Microwave transmitter-receiver

How remote supervisory control (via Microwave) helps SUNRAY reduce pipe-line operation costs

TWO YEARS of successful operation have proved that Sunray Oil Corporation's microwave system is a cost-cutting investment. *Two* operating positions now fully control *five* pumping stations. At the same time, 25% *greater volume can be run through the pipe lines.*

A 97-mile pipe line is used to interchange products between the company's refineries at Sunray Village (Duncan) and Allen, Oklahoma. An attendant at the main pumping station controls and monitors two unattended booster pump stations. On another pipe line 85 miles long, the operator at the main station controls a "booster" 31 miles away. On both pipe lines, RCA 960-mc Microwave systems link the control points and remote-operated "boosters."

HANDLES MANY CHANNELS

Sunray engineers selected RCA Microwave on the basis of cost, reliability, and capacity. Because of its capacity, microwave is the least expensive form of communication *per channel mile.*

Maintenance-wise, too, microwave cuts costs. Unattended relay stations, spaced miles apart, cost less to maintain than direct wire. RCA Microwave is virtually weatherproof . . . outage time is next to zero.

HAS HISTORY OF RELIABILITY

Since 1946, RCA has installed many fully reliable microwave systems, some over a thousand miles long. All have proved themselves in performance—for utilities, government agencies, telegraph companies, turnpikes, as well as pipe lines.

In addition to remote control and supervisory functions, RCA Microwave provides as many voice and teletype channels as needed—and does it with a minimum of frequency space. It employs readily available tubes and familiar circuits which are easy to service. It can be interconnected with telephone lines, switchboards and mobile communication systems.

COMPLETE SERVICE AVAILABLE

If desired, RCA supervises survey, construction and installation—provides a complete single-source, single-responsibility service. *For complete information, mail the coupon below.* And remember, the RCA Service Company provides nation-wide installation and service facilities.

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COMMUNICATIONS EQUIPMENT CAMDEN, N. J.

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Without obligation on my part, please send me your *free* booklets on:

☐ Pipeline Microwave Systems ☐ Radio-controlled Booster Increases Production

Name_____ Title_____

Company_____ Address_____

City_____ Zone____ State_____

☐ Have an RCA representative get in touch with me.

Use Buckeye Ditchers

To Do All These Jobs!

SEWER LINES • TELEPHONE LINES • FOUNDATIONS
ELECTRIC CABLES • FOOTINGS • COAXIAL CABLES
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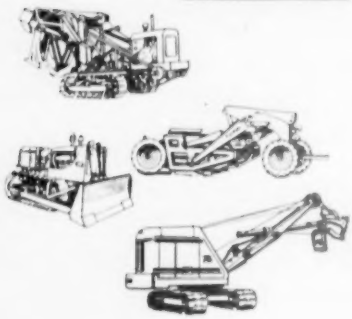
GATHERING LINES • CROSS COUNTRY PIPE LINES
ROAD DRAINAGE • WATER LINES • PARK DRAINAGE
IRRIGATION DITCHES AND GENERAL DITCHING

The BUCKEYE line includes both wheel-type and ladder-type ditchers capable of digging from 10" to 51" widths. Operates at low cost and frees hand labor for other work to keep job costs at a minimum!

No. 529

GAR WOOD GW INDUSTRIES



Gar Wood construction equipment includes 12 new TipDozers and Dozecasters, both hydraulic and cable controlled, for use with all models of Allis-Chalmers tractors . . . Big, tractor-drawn scrapers work smoothly and efficiently on both large and small earthmoving jobs . . . The new "75" series, ¾ yd. Gar Wood shovels and famous "Buckeye" Ditchers are useful on any job!

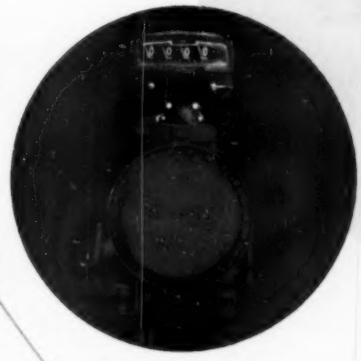
GAR WOOD INDUSTRIES, INC.

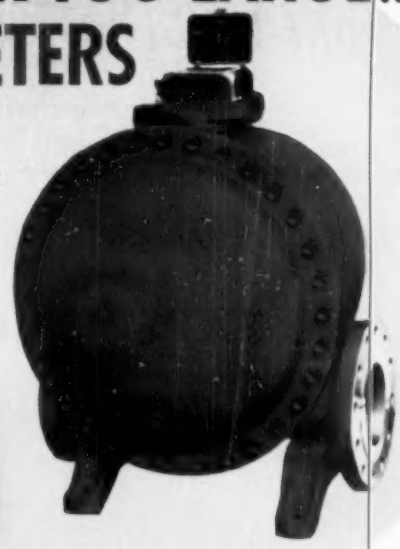
FINDLAY DIVISION • EXECUTIVE OFFICES • WAYNE, MICHIGAN

Construction Equipment: Excavators, Scrapers, Dozers, Ditchers, Spreaders, Finegraders, Truck-mounted Road Graders. Truck Equipment: Dump Truck Bodies & Hoists, Winches & Cranes, Refuse Collection Bodies, Elevating End Gates.

NO JOB TOO SMALL...NO JOB TOO LARGE... FOR BRODIE *BiRotor* METERS

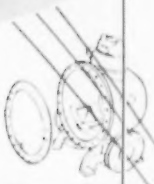
FROM THE LARGEST TO THE SMALLEST, EACH BIROTOR EMPLOYS THE SAME BASIC FEATURES:



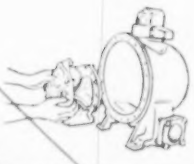


VIBRATIONLESS true rotary principle—smooth flow—complete static and dynamic balance.

JUST TWO MOVING PARTS in measuring element—no reciprocating parts.



WELDED ALL-STEEL HOUSING resists impacts, shocks, and surges.



MEASURING UNIT quickly removed or replaced without disturbing piping connections.

NO METAL-TO-METAL CONTACT in measuring unit to cause wear or repair.

SIMPLE PRECISION DRY ADJUSTMENT without special tools.

Lowest Maintenance Cost

With capacities from 170 B.P.H. to 1800 B.P.H.—and pressures up to 1000 P.S.I. every size and model of Brodie *BiRotor* Meter embodies the same basic features that have established unmatched records of performance in every phase of petroleum product metering. Look into Brodie *BiRotor* Meters today!

- **Smooth continuous delivery at all speeds**
- **High capacity with wide margin of safety**
- **Rugged unit-built construction**
- **Absorb fluid surges and shocks**

It's what's inside that counts!

BRODIE ALL-STEEL BiRotor TRUE-ROTARY METERS

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Profit-building **answers** *to* ***MODERN***

results of

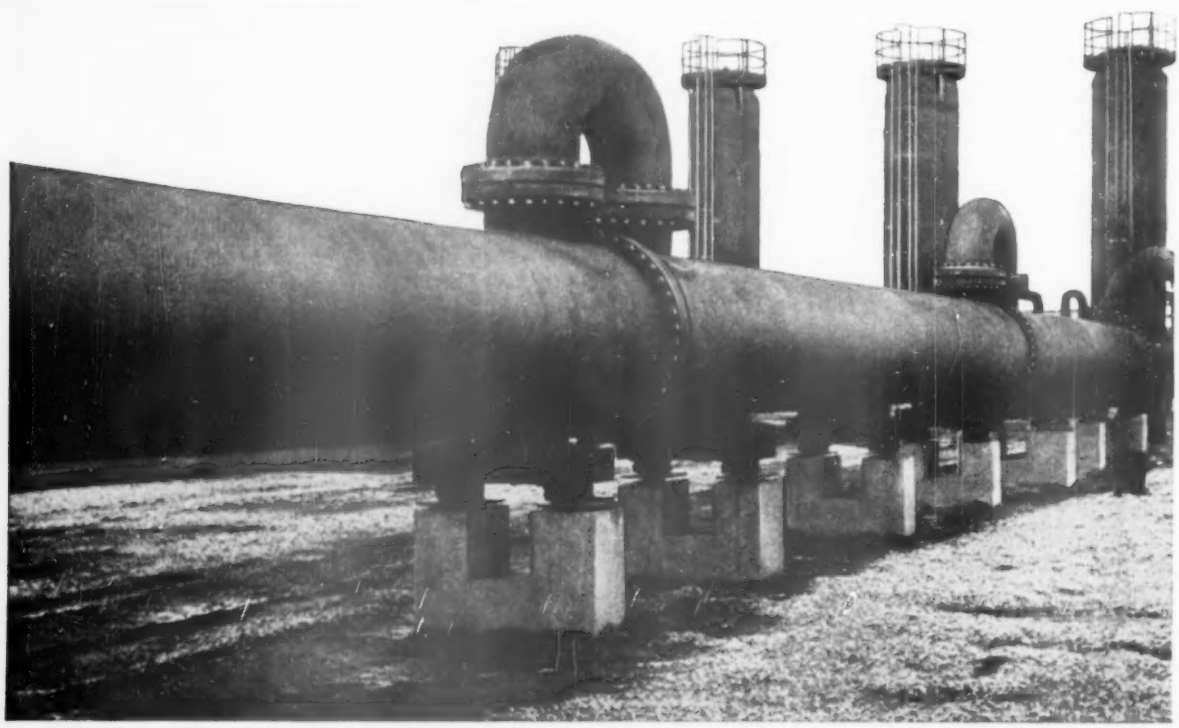
Alco EXPERIENCE

...gained through many years of designing and building heavy-metal equipment for refining and processing companies the world over.

and

Alco FACILITIES

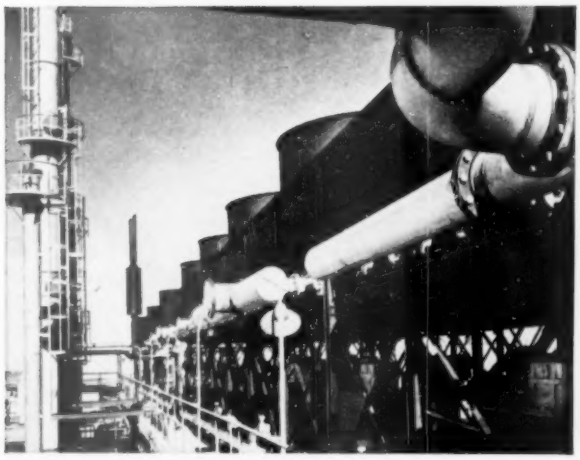
...capable of handling economically an extremely wide range of metal-fabricating operations...of meeting strictest customer specifications.



150 FT "TRAIN" HEAT EXCHANGERS, designed and built by Alco with special flange-to-flange construction, step up efficiency at Tennessee Gas Transmission Company's huge gas processing plant at Gabe, Kentucky. Other Alco units at Gabe include ethylene flash drum, demethanizer tower, primary feed cooler.

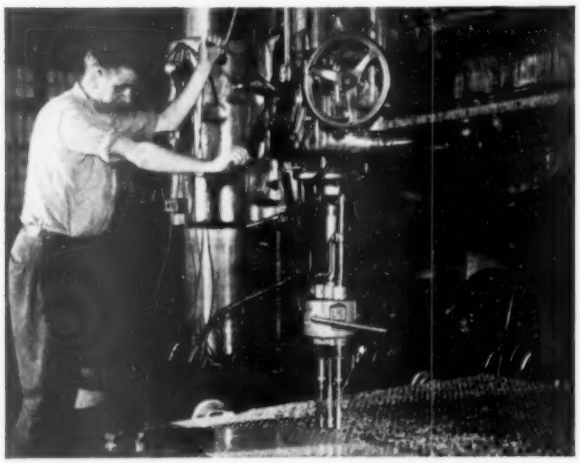
PROCESSING problems

...examples of the wide variety of heavy-metal equipment designed and built by Alco to meet today's demands in petroleum and petrochemical processing.



SPECIAL ALCO AIRCOOLERS, with many components of aluminum and stainless steel, handle 80 percent of cooling load at Celanese Corporation's new 630-acre petrochemical plant at Pampa, Texas. Units have removable headers and slide-out tube bundles, operate in constant presence of highly corrosive acids, chemicals and gases.

PRIMARY AND ATMOSPHERIC TOWER CONDENSERS, plus stabilizer condenser, naphtha cooler, kerosene and diesel oil exchangers, are among the many Alco units at Canadian Oil Refineries' new $23,000,000 plant at Sarnia, Ontario. This plant produces more than 115,000,000 gal. of gasoline annually, claims first catalytic reformer in Canada.



EIGHT FOOT RADIAL DRILL at Alco's modern, completely equipped plant at Dunkirk, N.Y., has multiple head for the precision drilling or reaming of several holes simultaneously. Unique facilities like this, many of them Alco designed, enable Alco to fabricate dependable, profit-building answers to toughest processing problems.

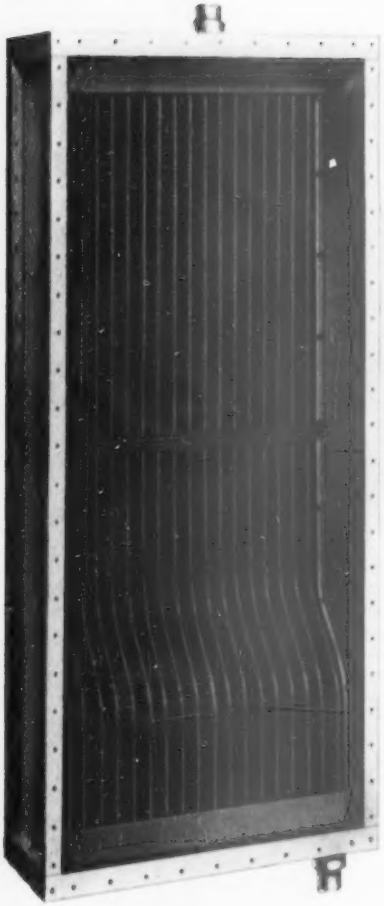
Let Alco facilities and experience produce profit-building answers to your processing problems. Contact your nearest Alco Products sales representative today. Offices in Dunkirk, New York, Chicago, Los Angeles, Kansas City, Houston, Tulsa and Beaumont.

ALCO

ALCO PRODUCTS DIVISION

AMERICAN LOCOMOTIVE COMPANY · DUNKIRK, NEW YORK

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

for

Heating
Cooling
Process
Air Conditioning

ASK THE AEROFIN MAN

Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

AEROFIN CORPORATION
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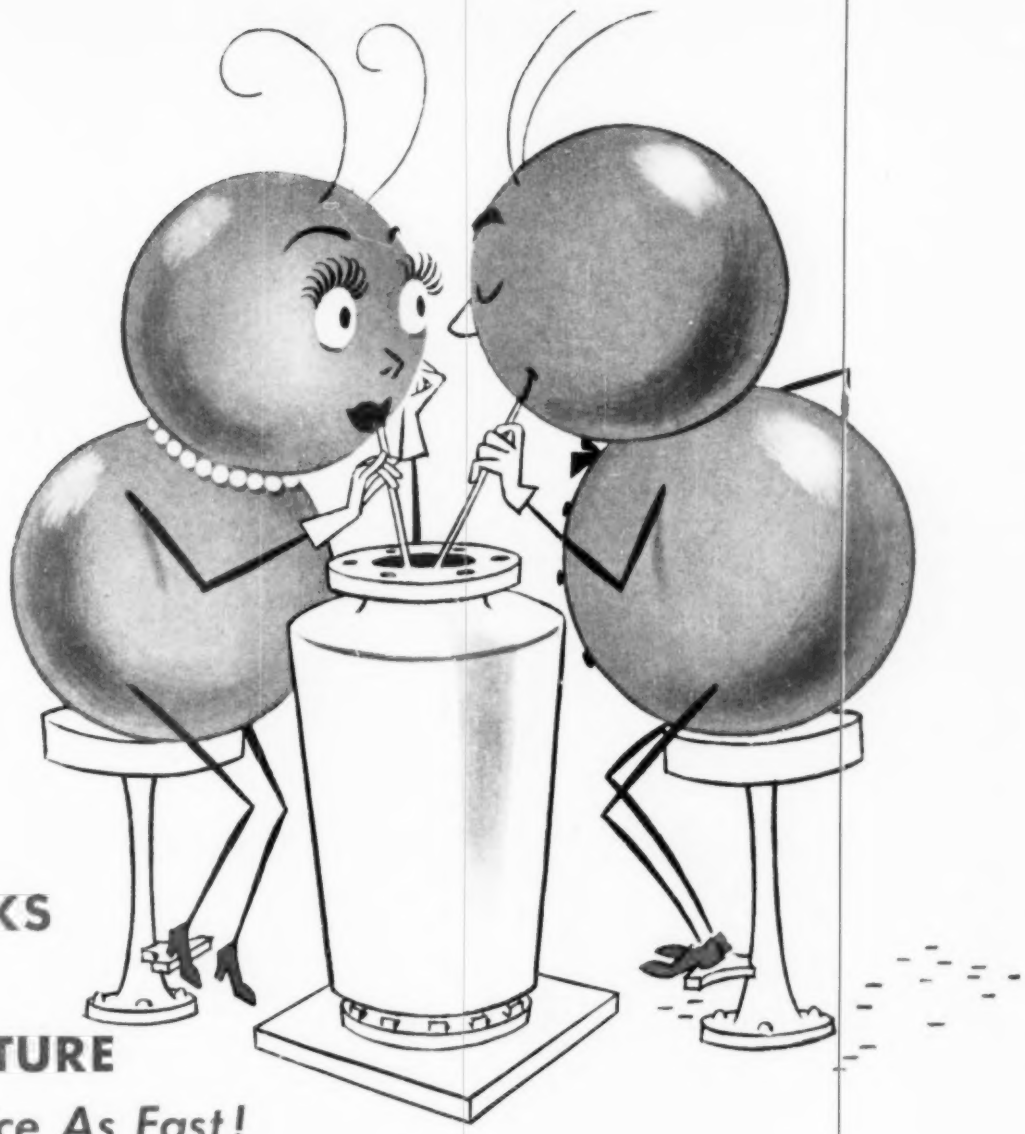

DRINKS UP MOISTURE

Twice As Fast!

Use S/V Sovabead in Your Dehydrator!

Ever watch two thirsty kids go to work on one soda? That's how fast S/V Sovabead drinks up moisture. It can almost *double* your dehydrator efficiency. And it stays just as thirsty at temperatures up to 120 F!

What's more, S/V Sovabead eliminates caking... reduces channeling, dusting and pressure drops. It also provides longer dessicant bed life... can be reactivated fast and economically.

Put *S/V Sovabead* to work in your dehydrator. Your Socony-Vacuum representative can tell you all about it.

SOCONY-VACUUM
process products

Process Products

SOCONY-VACUUM OIL CO., INC., 26 Broadway, New York 4, N. Y., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

Furfural unit in the $42,000,000 Cit-Con Oil Corporation Refinery near Lake Charles, Louisiana.

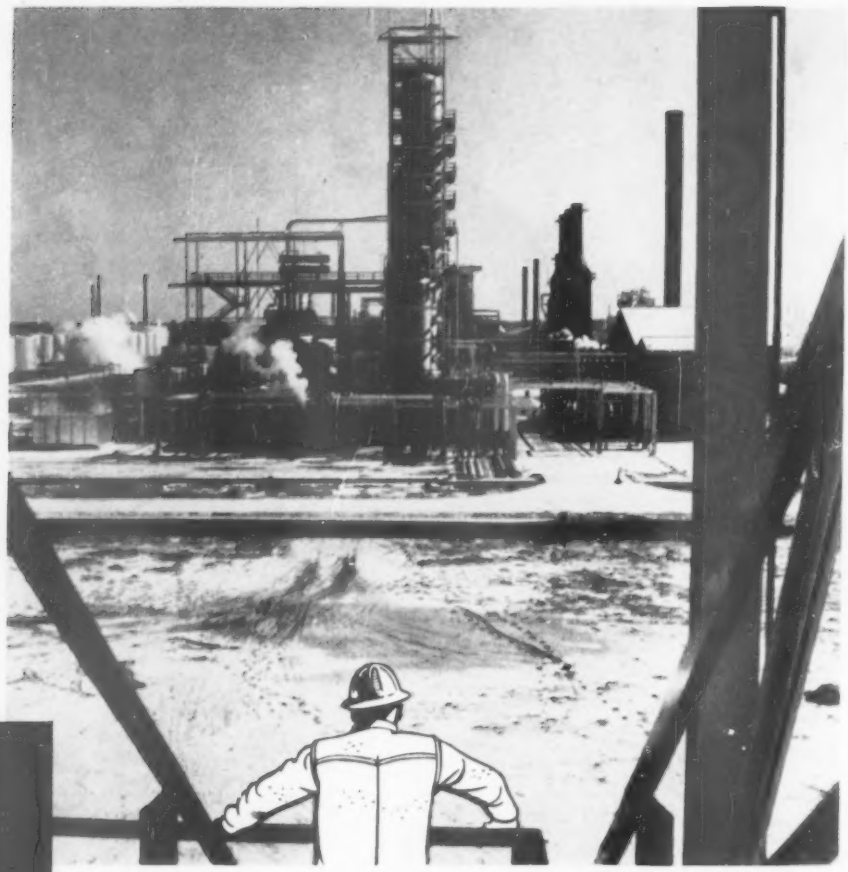

Photo: Cities Service Co., Fritz Henle

QO CHEMICALS

IT'S FURFURAL

First Choice

as Refining Solvent for More than 38 Petroleum Processing Plants Throughout the World!

QO Furfural*—Preferred for High Yields of High Quality Oil at Low Cost

SEPARATION **QO Furfural** is a polar molecule and gives sharp separation between the mixtures of products present in lube stocks. Its high specific gravity permits rapid phase separation.

RECOVERY **QO Furfural** is a stable compound, and may be recovered almost quantitatively for re-use.

SAFETY **QO Furfural** is easy to handle and has a safety record extending over 30 years of industrial use.

STORAGE **QO Furfural** is shipped in tank cars and stored in steel tanks. Its low freezing point makes it easy to handle in cold weather.

AVAILABILITY **QO Furfural** is produced the year around in large quantities at three plants from replaceable raw materials. It is low in price.

A request on your letterhead will bring you technical information about QO furfural (Bulletins 201-2-3) and its uses (Bulletin 204). Write today.

*QO Furfural is a liquid chemical produced by The Quaker Oats Company from agricultural residues.

FURFURAL • FURFURYL ALCOHOL • TETRAHYDROFURFURYL ALCOHOL
FUROIC ACID • FUR-AG' CONDITIONER • FURAFIL' LIGNOCELLULOSE

QO CHEMICALS

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In the United Kingdom: Imperial Chemical Industries Ltd., Billingham, England
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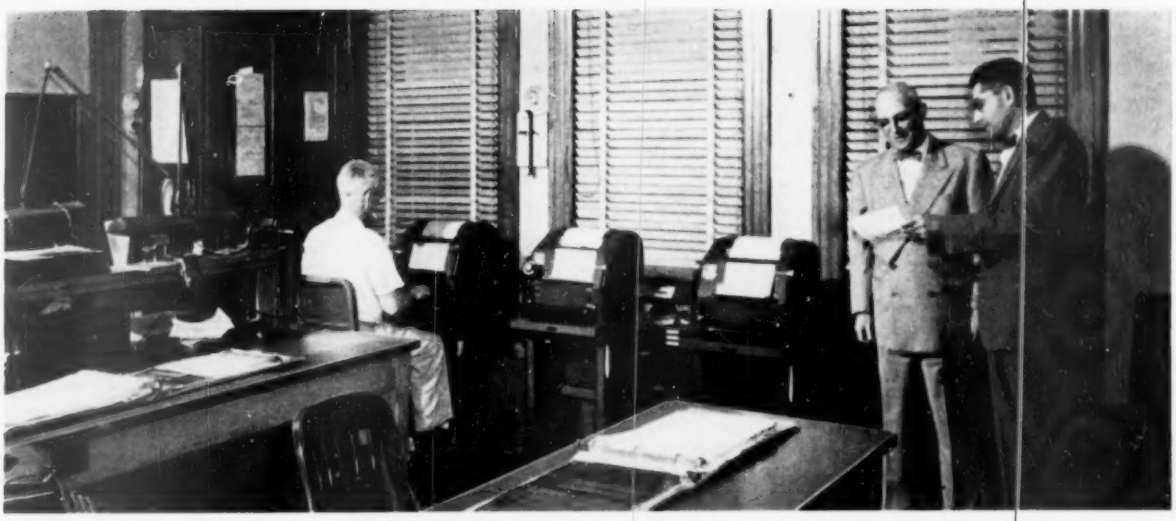
In Australia: Swift & Company, Pty., Ltd., Sydney • In Japan: F. Kanematsu & Company Ltd., Tokyo



A section of Buckeye Pipe Line Company's dispatching center, which controls an intricate system of crude oil lines by teletype. William Flannery, at the teletypewriter, is communicating with a station on a change in pumping orders. J. R. McNeff, Chief Oil Dispatcher, talks with J. D. McCullough, Supt. of Communications, right.

Bell System Service helps Buckeye Pipe operate smoothly

Buckeye Pipe Line Company moves hundreds of thousands of barrels of crude oil and refined petroleum products daily in seven states. To keep lines operating smoothly, the company relies on 3000 circuit miles of Bell System Teletypewriter Service.

"The reliability of this service has been *99.5%!*" reports J. D. McCullough, Superintendent of Buckeye Communications.

This remarkable record of reliability has paid big dividends. Mr. McCullough adds:

"It has resulted in increased efficiency, considerable economy, and has maintained our reputation as a dependable, efficient carrier."

Bell System communications are an economy no pipeline operator can overlook. When you can get Bell System reliability, why tie up capital in communications equipment or set up reserves for maintenance and obsolescence?

We can furnish services to meet your exact requirements whether they are private-line telephone, mobile telephone, teletypewriter or channels for remote metering and supervisory control.

. . . . .

Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

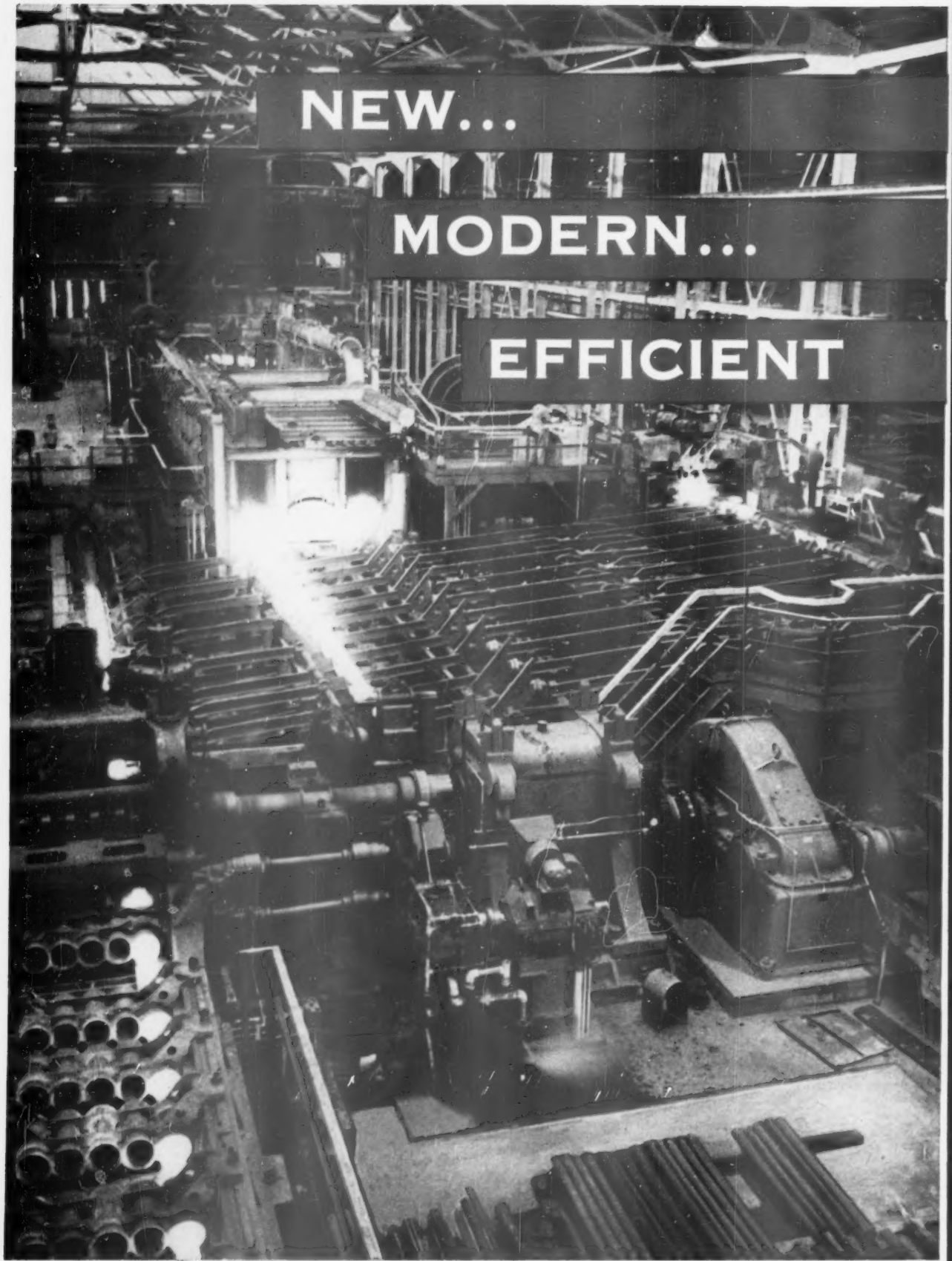
PRIVATE-LINE TELEPHONE

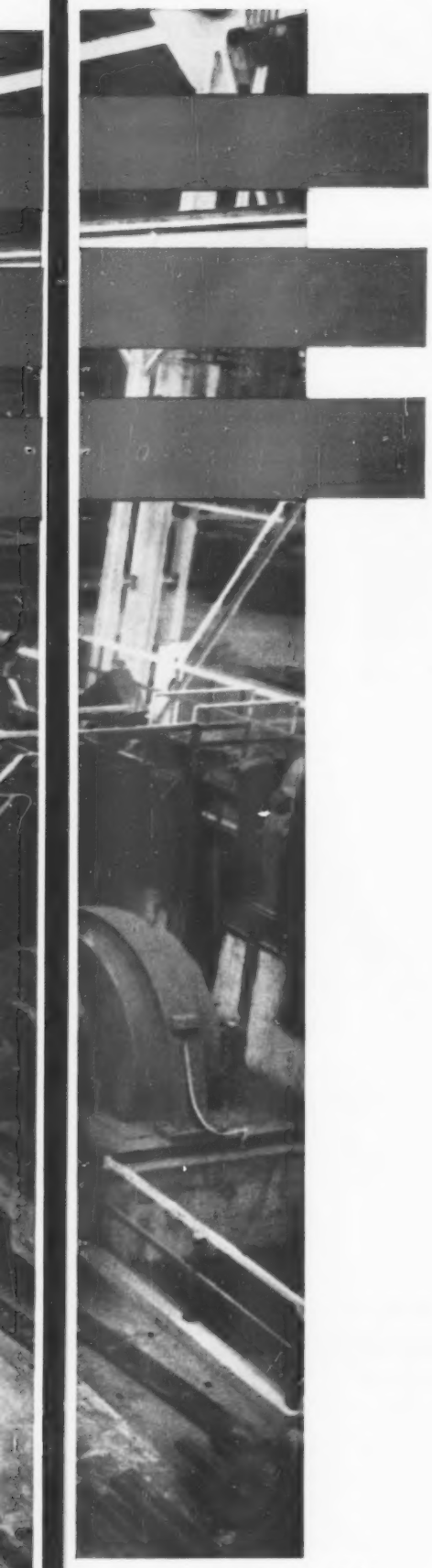
TELETYPEWRITER

MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM


NEW...
MODERN...
EFFICIENT



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SEAMLESS TUBE MILL

Now from the heart of a rapidly developing oil and gas region the new CF&I Seamless Tube Mill becomes a source of supply for Seamless Oil Country Tubular Goods. From the precision controlled piercing and rolling mills to the finished product . . . each step of production is maintained under rigid control, assuring the same high standards of quality demanded of every CF&I product.

CF&I Seamless Oil Country Tubular Goods meet all API STD 5A specifications and are available in sizes ranging from 2⅜" O.D. through 9⅝" O.D. Specify CF&I for top quality Seamless Oil Country Tubular Goods.

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STURDYBILT Houses have ALL the advantages of conventional houses, and NONE of the disadvantages. STURDYBILT Houses are weather-tight, constructed to last, and are roomy, comfortable and beautifully designed.

STURDYBILT Houses, because they are prefabricated at the factory, can be moved to any site, erected in days instead of weeks or months, and are easily taken down and transported to another location with little or no loss of material.

Investigate STURDYBILT Prefabricated Demountable Houses today.

MANUFACTURERS OF SPECIAL MILLWORK, DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

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STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

They Say—

Effect of Gas-Price Regulation

"If we may be guided by the experience of the natural-gas companies, Federal Power Commission regulation of the price of gas may be based on the investment in successful ventures only without regard to the large amounts of capital lost in unsuccessful ventures. If an attempt is made to allow for these factors, vexing questions immediately arise as to what part of exploration expense, dry hole costs, and surrendered leases should be borne by gas instead of oil, and would doubtless lead to control of oil if any allocation of such expenses were attempted. Moreover, under such a criterion or standard for determining a proper return, the gas producer would not be able to borrow money to carry on his operations and new discoveries would rapidly diminish. Also, the producer in order to avoid the consequence of Federal Power Commission regulations would concentrate on selling his gas in the state where produced, thus reducing the quantity of gas moving interstate. Shortages in gas supplies for interstate markets would result from all of these factors; and these shortages would necessarily mean higher costs of transportation and distribution since, with fixed investments in facilities for these operations, a decline in the volume of business handled means a corresponding rise in the unit costs. The shortage of gas thus brought about by the control of price would increase the cost of transportation and distribution, which makes up from 85 to 95 per cent of the delivered price to the residential consumer. Thus it is clear that the application of government price control to gas in the field would defeat its alleged purpose of protecting consumers, and in time would actually result in reduced supplies as well as in higher delivered prices."

Rex G. Baker, vice president of Humble Oil & Refining Co., addressing the annual meeting of the New Mexico Oil & Gas Association, Albuquerque.

Iranian Oil May Come Back Soon

"The resumption of diplomatic relations between Iran and Britain is a cause for satisfaction politically, not economically. Iranian oil is not needed in present circumstances.

"Premier Zahedi . . . had a realistic survey made. Among other things he learned that with many outside technicians and some $5,000,000 or $6,000,000 expenditures, a flow of one-fifth to one-third of full normal production could be achieved by late spring or early summer of 1954.

"That will mean a great deal to Iran but not to the petroleum industry or the West in general. What does mean much is that Iran should achieve political and economic stability in order to remain a nation free of Russian domination."

Editorial in the New York Times.

Petrochem Industry Moving South

"One of the major factors in the economic growth of the South and Southwest is the growing petrochemical industry.

"The South produces two-thirds of the nation's oil and three-fourths of its natural gas and has attracted 85 per cent of the petrochemical industry.

"The move southward was natural because of the economics involved by having plants and raw materials near one another. This movement, begun in the mid-30's, has brought more than 20 major chemical companies within the past 15 years.

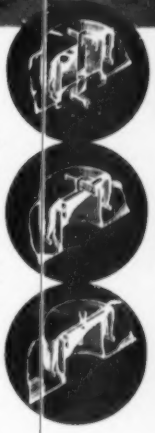
"The growing number of petrochemical plants scattered over the South point

GLITSCH

BUBBLE CAPS...

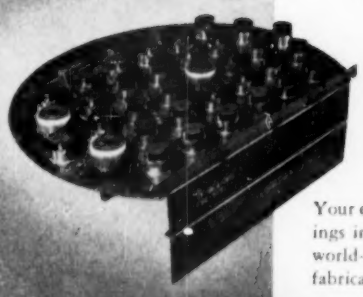
ANY SHAPE
ANY SIZE . . .

Existing dies of 287 different cap and riser designs, as well as data on various ratios of related areas, are available to your engineers during planning stages. Practical ideas for improvements to keep apace constantly changing petroleum refining and chemical processing are a GLITSCH service of world-wide proportions.



GLITSCH "TRUSS-TYPE" TRAYS

Lightweight, simple, adaptable with complete freedom of layout, GLITSCH "Truss-Type" mechanical design is not restricted to standardized patterns. You specify your process requirements.



Your engineering staff can effect definite savings in initial designing through GLITSCH world-wide experience in plans, design and fabrication of tower internals.

Cost analyses of tower internal equipment for fabrication in a wide range of material are available promptly.

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to a continuation of the further industrialization of an area which can do well to attract still more industry."

Editorial in The Oil Review, Jackson, Miss.

Everyone Benefits From Research

"There is no industry on earth for which painstaking research has paid the dividends it has paid in the oil business. But there is more to this research than shows up in the dividend statements of a company lucky enough to get basic patents on a refining trick or to hit upon a new device for oil recovery. The fruits of this research is a triumph for all mankind, since we all share directly or indirectly in the amount of wealth that can be wrung from a resisting earth."

Editorial in the Tulsa Tribune.

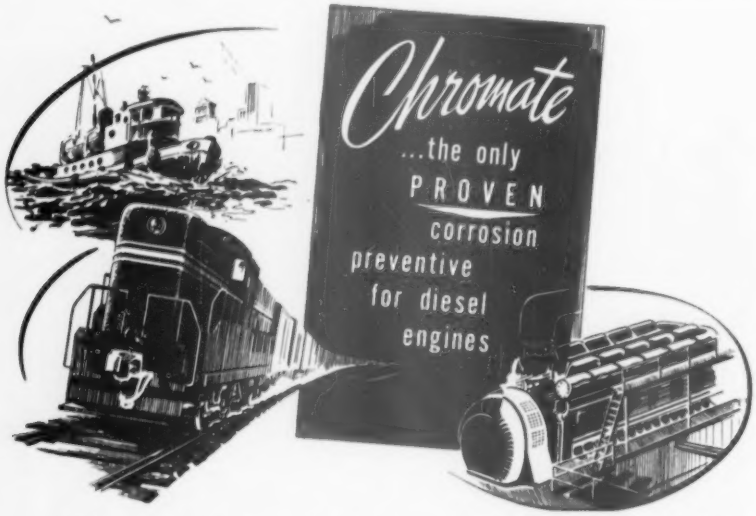
Incentive for Reinvestment

"Equally important to attracting new capital depletion allowance is bait for reinvesting capital into search for oil after discovery has been made and production begins to decline.

"Make no mistake, without this amount of capital we would not as a nation be where we are today, and where we hope to be tomorrow. Since depletion was first allowed in 1918, we have produced 90 per cent of all oil ever produced in this country.

"Can there be any doubt as to important part this tool has played in search for production of crude oil?"

W. K. Whiteford, president of Gulf Oil Corp., addressing the Rocky Mountain Oil & Gas Association, Denver.



Chromates are the only tried and true answer to controlling cylinder-liner corrosion in diesel engines. Use of chromium inhibitors is universally accepted by locomotive builders.

Sodium chromate stops corrosion before it starts. The presence of this one chemical renders the metal surface passive to corrosive attack. Slight oxidizing action occurring upon initial contact produces an additional safeguard — a protective surface-deposit of iron and chromium oxides.

Diesel locomotives require only 2000 to 2500 ppm sodium chromate at pH 8.5 to 9.5 to minimize the combined effects of vibration and corrosion. Other units such as standby boilers, stationary and marine diesels, hot water heating systems, and automobile radiators vary in their anti-corrosive requirements from 200 to 5000 ppm sodium chromate. It is important that sufficient chromate concentration be maintained at all times, for to leave valuable equipment unprotected even for short periods may result in serious damage.

Mutual, the world's largest manufacturer of chromium chemicals, supplies the chromates necessary for cooling system protection. Information about corrosion prevention in all types of cooling systems will be sent upon request.

SODIUM CHROMATE • SODIUM BICHROMATE
POTASSIUM BICHROMATE • CHROMIC ACID

MUTUAL SINCE 1845

Mutual Chemical Company of America
270 Madison Avenue, New York 16, N. Y.
Plants at Baltimore and Jersey City

CALENDAR OF EVENTS

JANUARY

11-15 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler Hotels, Detroit.

12-14 National Constructors Association, annual meeting, Hotel Commodore, New York City.

18-20 Pipe Line Contractors Association, sixth annual convention, Shamrock Hotel, Houston.

18-22 American Institute of Electrical Engineers, winter general meeting, Hotel Statler and Hotel McAlpin.

25-28 Plant Maintenance & Engineering Conference, Hotel Conrad Hilton, Chicago.

27-29 Ninth annual symposium, "Instrumentation for the Process Industries," Texas A. & M. College, College Station, Tex.

25-28 Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

FEBRUARY

1-5 National Association of Corrosion Engineers, annual short course in corrosion, Washington State College, Pullman, Wash.

4 Instrument Society of America, ninth annual regional conference, Hotel Statler, New York City.

11-12 Western Petroleum Refiners Association, regional meeting, Hotel Beaumont, Beaumont, Tex.

22 American Association of Petroleum Geologists, Rocky Mountain section, annual meeting, Albuquerque, N. M.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

1- 5 American Society for Testing Materials, spring meeting, Shoreham Hotel, Washington, D. C.

3- 5 American Petroleum Institute, Division of Production, Southwestern district, Rice Hotel, Houston.

4- 5 American Gas Association, transmission and storage conference, Jung Hotel, New Orleans.

8-10 American Institute of Chemical Engineers, Statler Hotel, Washington.

15-19 National Association of Corrosion Engineers, annual meeting, Municipal Auditorium, Kansas City, Mo.

17-19 American Petroleum Institute, Division of Production, Mid-Continent district, Biltmore Hotel, Oklahoma City.

23-April 1 American Chemical Society, annual meeting, Municipal Auditorium, Kansas City, Mo.

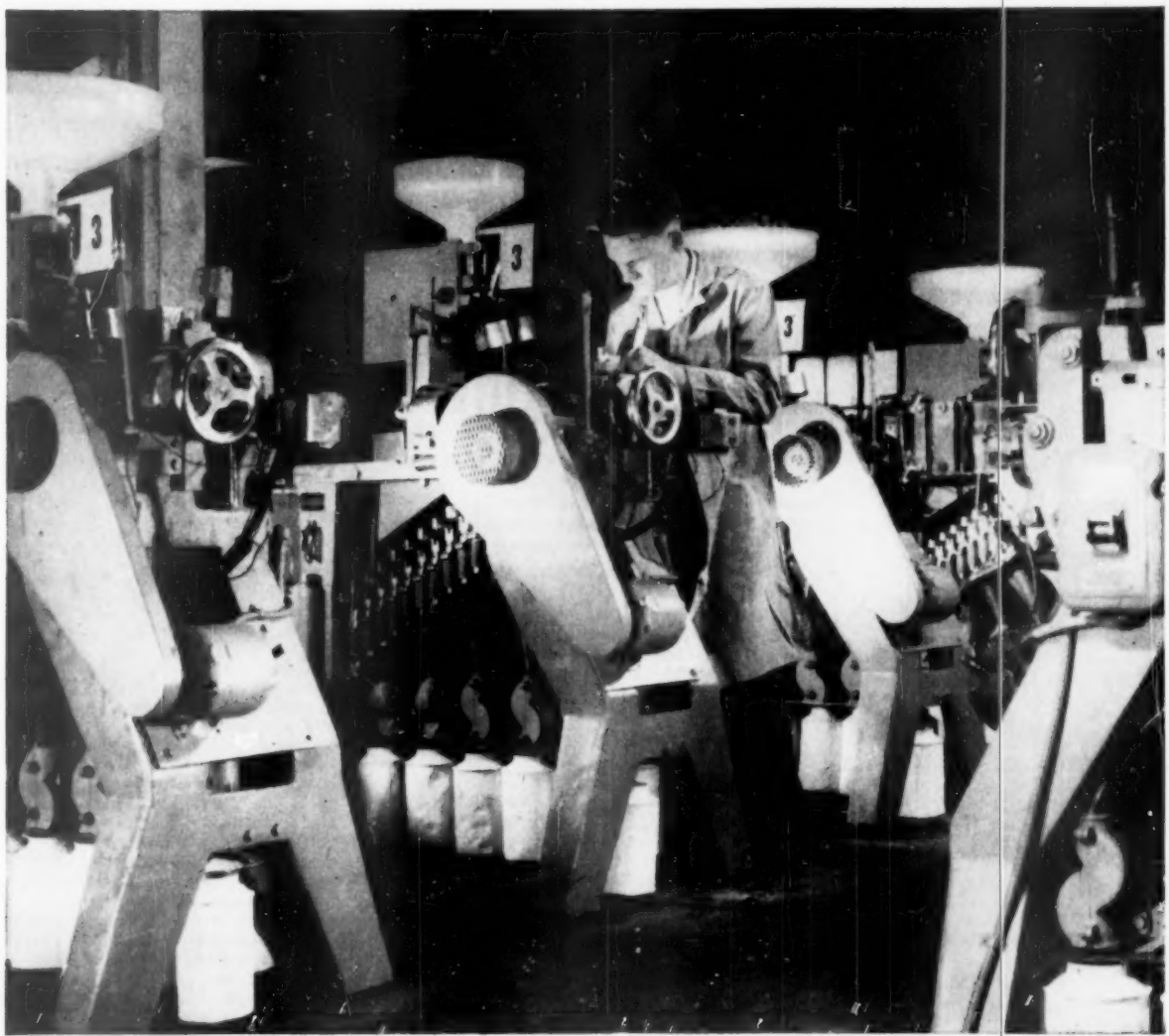
In each and every bearing, we match rollers to almost microscopic limits

NOT satisfied to finish rollers to extremely close tolerances, Timken Company engineers designed the special machines you see pictured below. They sort rollers into even more precise sub-sizes so we can match the rollers in *each* and *every* bearing to almost microscopic limits. Result: each roller carries the same load, assuring quieter operation, longer life.

This is typical of the many extra steps we take to give you more for your money than any other bearing manufacturer. In fact, only with Timken® bearings do you get *all* these advantages: advanced design, precision manufacture, rigid quality control, special analysis Timken steels. The end result is that every Timken bearing insures longer life, reduces friction and cuts maintenance costs to a minimum.

Whether you're buying or building machinery, specify Timken bearings. Or if you're replacing bearings, insist on Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

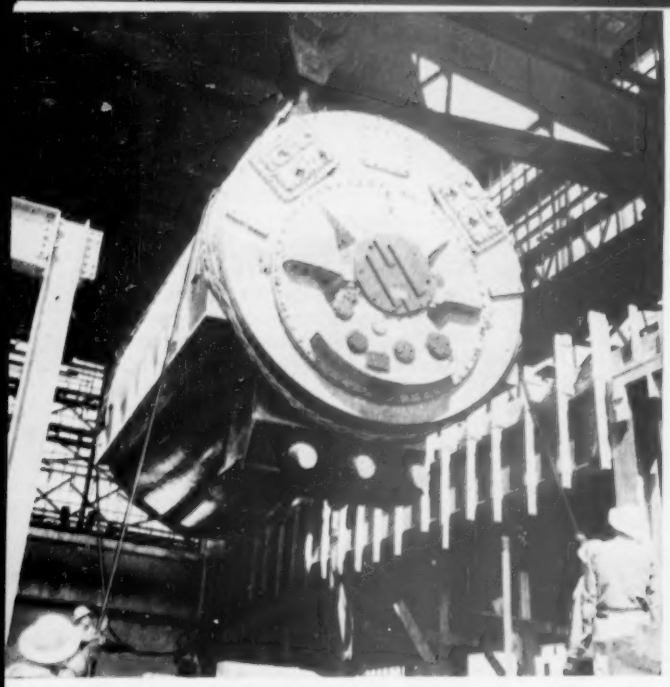


TIMKEN

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭

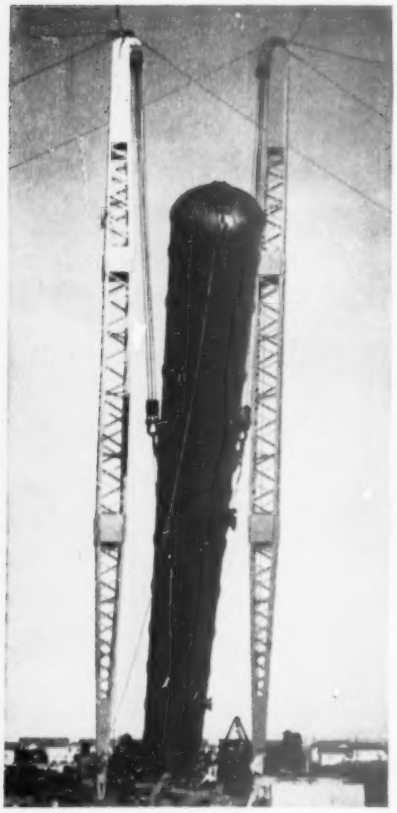
BEARING TAKES RADIAL ◊ AND THRUST ◊ LOADS OR ANY COMBINATION ✳



Multiple-part Red-Strand Slings are always trusted to handle heavy loads. They are easy to apply to both the load and the crane hook. User tests in Detroit proved Red-Strand slings withstood unusual abuse, yet maintained higher-than-rated strength.

A Gary plant uses Red-Strand single-part slings for many lifting jobs like this. These slings are available with various combinations of end fittings for attaching the sling to rings or lugs. Single-part slings frequently are the most economical to use.

How to Select the Correct Sling for Your Job



A heavy cylindrical load like this usually calls for the use of multiple-part Red-Strand Flat-Laced slings. They are strong, flexible and do not slip or abrade on smooth round surfaces.

Start your sling selection by analyzing five factors:

1. The load—its size, weight, shape, finish.
2. Working area, amount of head room.
3. Size and type of crane hook.
4. Angle of sling legs.
5. Location and type of lugs or rings, if any.

This is basic information. From it, your supplier can recommend the sling by type, size and length that is safest, longest lasting and most economical for your job.

Types of Slings

Multiple-part slings are always recommended for heavy duty service, because for equal strength they are far more flexible than single-part slings. They hug the shape of the load easily, present a greater bearing surface to the load, and reduce the possibility of marring finely finished surfaces.

Where these factors are not so important, either Red-Strand ***single-part slings*** or ***grommet slings*** may be used for economy. Single-part Red-Strand slings are often recommended for lifting lighter weight objects, or those that have fixed attaching rings or lugs. Grommet, or continuous strand Red-Strand slings are ideal for forming hitches of various types without fittings.

How to Gain Extra Savings

Two suggestions will help you save money on slings.

Re-useable Pin-Lock thimbles reduce sling costs by 21%

The first is to re-use Pin-Lock thimbles on multiple part slings. They increase sling life by protecting loops from abuse or damage. Besides, these exclusive Leschen Pin-Lock thimbles cut sling costs on an average of 21% because they may be used again and again. They lock into sling loops with pins instead of permanent clamps, permitting re-use, and eliminating constant expense of thimble replacements.

The second suggestion is to use Red-Strand slings—for a very simple but good reason: Red-Strand slings are made of ***higher-than-rated*** quality Leschen wire rope that delivers ***longer-than-expected*** service.

Get a copy of Leschen's *Sling Handbook* for complete information. Ask your Leschen man for one, or write.

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
St. Louis 12, Missouri

LESCHEN
HERCULES *Red-Strand*
WIRE ROPE

29-31 Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.

APRIL

4- 6 Texas Independent Producers and Royalty Owners Association, Rice Hotel, Houston.

5- 7 American Society of Lubrication Engineers, Netherland-Plaza Hotel, Cincinnati.

6- 8 Petroleum Industry Electrical Association, annual convention and exhibit, Adolphus and Baker Hotels, Dallas.

8- 9 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Townsend Hotel, Casper, Wyo.

12-16 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, annual meeting, St. Louis.

13-15 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

14-16 National Petroleum Association, fifty-first semiannual meeting, Cleveland Hotel, Cleveland.

21-23 Natural Gasoline Association of America, thirty-third annual convention, Baker Hotel, Dallas.

26-28 Southern Gas Association, annual convention, Houston.

MAY

2- 4 Independent Petroleum Association of America, midyear meeting, Cosmopolitan Hotel, Denver.

3- 5 American Geophysical Union, thirty-fifth annual meeting, National Academy of Sciences, Washington, D. C.

6- 7 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

10-12 American Petroleum Institute, Division of Transportation, Products Pipe Line Conference, Warwick Hotel, Philadelphia.

10-13 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

17-19 American Petroleum Institute, Division of Marketing, midyear meeting, Cosmopolitan Hotel, Denver.

24-26 American Gas Association, production and chemical conference, William Penn Hotel, Pittsburgh.

27-28 Natural Gas and Petroleum Association of Canada, Prince Albert Hotel, Windsor, Ont., Canada.

31-June 5 American Petroleum Institute, Division of Production, midyear committee conference, St. Francis Hotel, San Francisco.

JUNE

3- 4 Pennsylvania Grade Crude Oil Association, thirty-first annual meeting, Hotel William Penn, Pittsburgh.

6-11 Society of Automotive Engineers, summer meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

13-18 American Society for Testing Materials, annual meeting and exhibits, Sherman Hotel, Chicago.

17-19 American Petroleum Institute, Division of Production, eastern district meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

20-24 Canadian Gas Association, Banff Springs Hotel, Banff, Alta., Canada.

27 July 1 Petroleum Equipment Suppliers Association, nineteenth annual meeting, Manoir Richelieu, Murray Bay, Que., Canada.

Here's the biggest advance in Compressor Valves in 25 years!

...THOMPSON-ENGINEERED *to save you maintenance dollars*

If you operate any type of air or gas compressors with valves from 2½" to 11½" in diameter, you can make important savings on valve replacement and compressor maintenance costs with this Thompson poppet type Valve!

See if this valve isn't everything *you* want for compressor service . . .

Simple Design – eliminates all complicated parts.

Rugged Construction – enables the valve to take the pounding of compressor service year in and year out without fail.

Increased Efficiency – gives better response to pressure and volume changes, with reduced wear on poppet valve, seat and springs.

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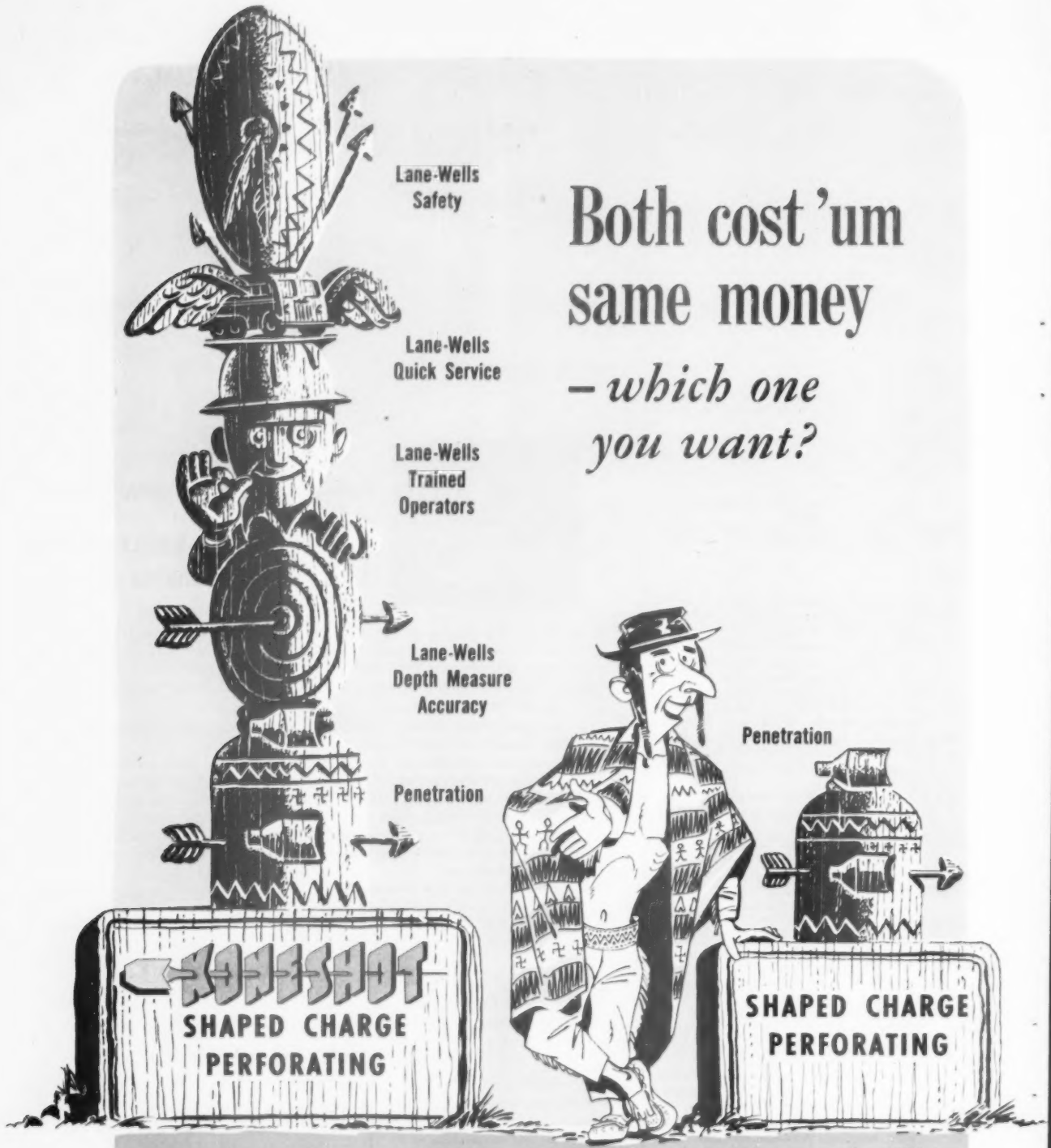

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THE OIL AND GAS

JOURNAL

TULSA, OKLAHOMA

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Miller's Monster

OUR favorite oil publication is starting off the new year right with an improved service to readers interested in oil-industry equipment (and who isn't?). It centers around the postcard reproduced here and which can be found life-sized, and in triplicate, alongside the "Digest of New Equipment" department which is now in every issue.

Here's the pitch: You read this Digest every week and more often than not you want a copy of one of the bulletins mentioned, or more dope on some of the intriguing gadgets described and pictured. So you just tear out a card along the dotted line, check the numbers of what you want, sign your name, and drop it in the nearest mail box. No postage required. Then you route your copy of the Big Yellow Book to a couple of other guys who do the same with the other two cards.

But that's not all. Our advertising pages—of which we try hard to have quite a few each week—also tell of equipment and services, new and old, about which you want to know more. No longer do you have to write a letter to the advertiser; we'll do it for you if you simply make the necessary notations in the special places on the card. Easy as pie.

But our biggest improvement in service is our new method of rushing your requests to the proper companies within 48 hours after we receive them. The secret is a formidable-looking apparatus technically known as a photographic reproduction machine but around our shop affectionately referred to as "Miller's Moster" because it saves so much work for Dan Miller and his crew of girls who handle this job. Miller's Monster flicks off enough photocopies of your card to send one to everybody concerned, and out they go in the next mail.

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One other thing. You'll notice down at the bottom of the card a line to the effect that this offer is not good after 90 days. That's to discourage people from using cards from real old issues (most readers, you know, treasure their Journals so highly that they never throw them away). Our advertisers like nice, fresh inquiries—particularly if they're about some bulletin which might be out of print in a few months.

However, if you're marooned at the North Pole or on a South Seas island where the mail service isn't so hot, we'll waive that 90-day rule for you. Otherwise, if you want something mentioned in an old issue, better write Dan Miller a letter about it; he has a heart, though his monster hasn't.

We hope you take advantage of this improved service. The whole purpose is to help readers and save them time and money—which, incidentally, is our only excuse for being in business at all.

—*Henry D. Ralph.*

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The unit is constructed of a number of individual "petals" made of flexible sheet metal. These petals are mounted on reinforcing spring steel ribs, which in turn are mounted on a ring to form a Basket.

When running-in the hole, the upward pressure of the fluid tends to close the "petals" thus providing fluid passageway between the Basket and the walls of the hole, without distortion of the Basket. As soon as the Basket comes to rest, upward pressure by the fluid is relieved and the petals expand to contact the walls of the hole. Any tendency of fluid to move downward then presses the flexible petals more firmly against the entire circumference of the hole. Solids strained from the fluid tend to build a bridge inside the Basket which is thus converted into a one-way, open hole packer of great strength and effectiveness.

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The "Metal Petals" not only expand to contact the circumference of large-diameter holes, but also pack-off in holes of irregular shape; and the independent action of the individually mounted overlapping petals permits successful use of the Basket in casing programs with minimum clearances.

All-metal construction and design provide ample strength; lessen the possibility of splitting or otherwise damaging the Basket.

Baker Metal Petal Baskets are "slidably" mounted to permit rotation, spudding, or reciprocation of the casing without distorting or damaging the Basket.

MOUNTINGS TO MEET ALL NEEDS

Baker Metal Petal Baskets are furnished mounted on plain or perforated nipples; with or without different types of Baker Whirler Float Collars; for a wide range of cementing applications.

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Ask any Baker representative for specific recommendations as to how Baker Metal Petal Baskets solve specific cementing problems

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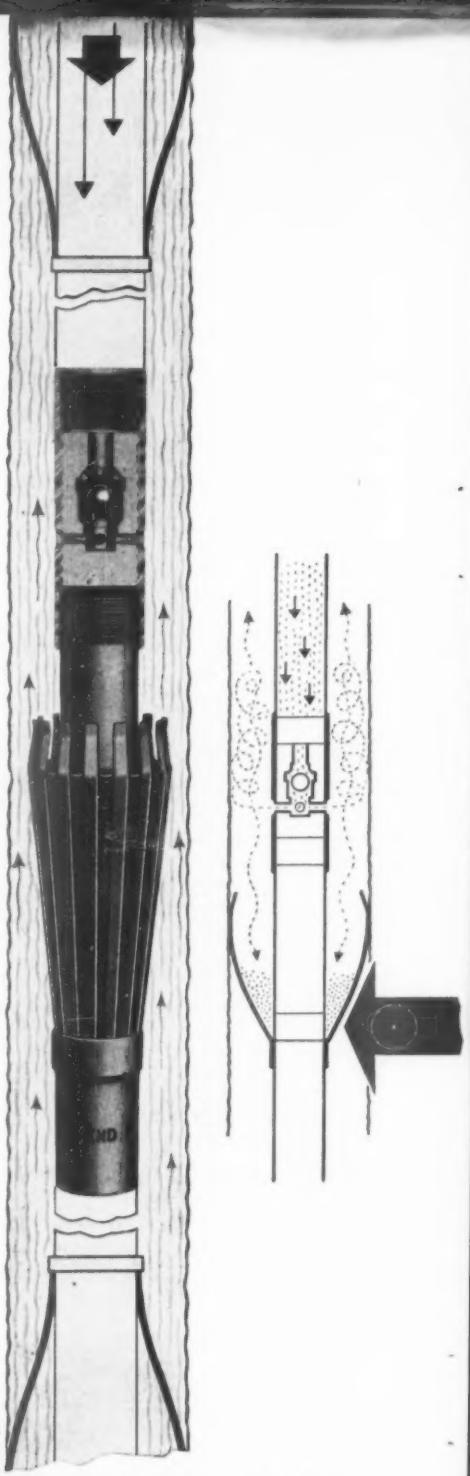

A popular hook-up consists of a Baker Metal Petal Basket mounted on nipple, with a Baker Cement Whirler Float Collar with Solid Baffle (Product No. 305) which whirls the cement slurry outward and upward through the baffled, side-whirler ports.

The overlapping "petals" (each mounted on its individual spring steel rib) provide flexibility and freedom of expansion to pack-off around the circumference of large-diameter holes, or holes of irregular contours.

For oil, 1954 means restraint, not stagnation

DETAILED forecasts of what the petroleum industry can expect during 1954 are currently being issued in many quarters (the Journal's own will be in our issue of January 25), but it seems certain that oil is in for an "inventory adjustment."

This means that the industry must hold its production down to actual market demand, work off excess inventories, carry some surplus capacity, return to intensive competition, and keep a close watch on costs. Most other industries have done or are doing this.

ANOTHER way of saying it is that 1954 should be a year of restraint, a period of informed and sagacious business judgment.

Unlike some industries, oil doesn't have to cut back to a level of demand lower than recent years. It just has to sit tight for a short while until demand catches up with it. There is every indication that the current oversupply of oil is only temporary, and that the slack will be taken up within a period of months if there is restraint all around.

Even the problem of imports may become minor before the year is out, provided importers can restrain themselves from going above recent levels of crude imports. And if domestic production is restrained to only a gradual increase, the present burdensome excess stocks can be worked off fairly soon.

Refiners also must mix restraint and foresight. With heating-oil stocks and the thermometer both above normal, it wouldn't take much of an increase in runs to spell trouble for everybody. And new additives and sales campaigns can't be relied on to bring total gasoline stocks down to proper levels next summer if they keep on building up at the rate of recent months.

BUT restraint doesn't mean stagnation in 1954. The industry can keep moving ahead while achieving its adjustment. This country will consume more oil in 1954 than ever before, and still more in future years, so exploration and drilling should not be relaxed.

The reserve producing capacity which seems such a threat at the moment would disappear rapidly if new discoveries weren't made at a normal rate, and today's competitive technology will soon make obsolete refineries which don't keep on modernizing.

As things look today, 1954 will turn out to be a pretty normal year for oil if the industry can get through a relatively short period of restraint and readjustment.

In Step with Oil Industry Progress

● Dynamic progress in all the many phases of the Petroleum Industry—production, exploration, development, refining, transportation, storage, conservation—is a factor of ever-growing importance in the national economy.

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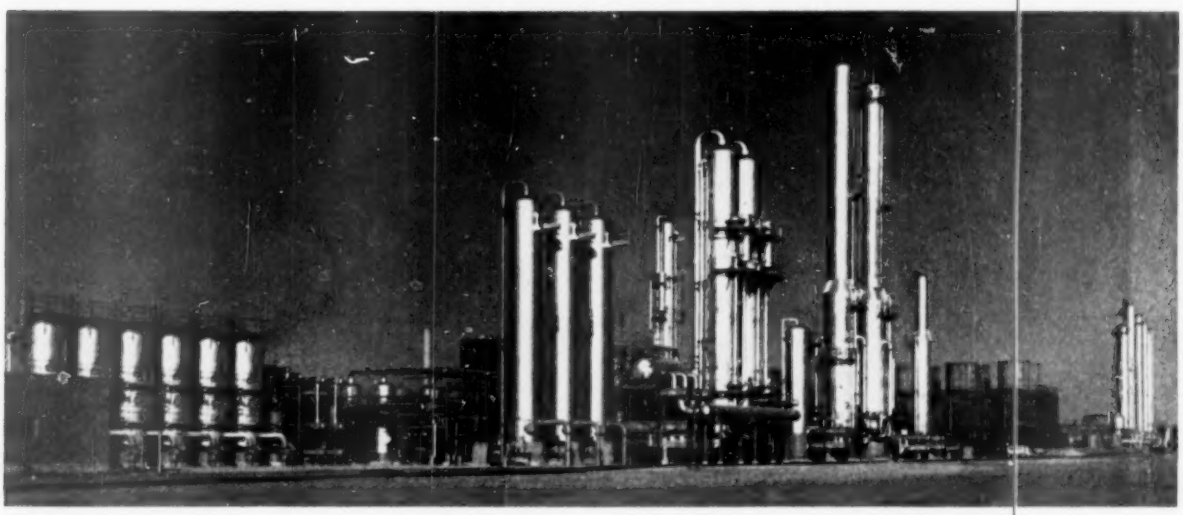
THIS WEEK... ...IN THE NEWS



BIGGEST CONTRIBUTOR to the growing supply of liquefied petroleum gas, and one of the newest, is this installation of National Petro-Chemicals Corp. at Tuscola, Ill. This plant and 14 others completed in 1953, added an L.P.G. production capacity last year of 550,000,000 gal. per year. Another 12 plants are scheduled for completion in 1954 which will add another 220,000,000 gal. to the nation's capacity. For latest record figures on the booming L.P.G. industry, turn the page.

PRODUCTION—Decrease in U. S. production during October keeps world production on the downgrade for third successive month. . . . Free-world output drops nearly 150,000 bbl. daily. . . . Kuwait's gain of 126,800 bbl. daily over September enables it to displace Saudi Arabia as Middle East's biggest producing country. . . . ¶Dunn County, North Dakota, rank wildcat of Carter, Sinclair, and Socony-Vacuum recovers 415 ft. of 32°-gravity oil on a drill-stem test between 9,018 and 9,066 ft. . . . Wildcat is 20 miles southeast of Nesson anticline production, 60 miles northeast of the Fryburg area discovery in Billings County. . . .

NATURAL GAS—A.G.A., in annual year-end report, estimates industry will spend $2,500,000,000 in expansion during next 3 years. . . . Almost $2,000,000,000 of it will go for transmission facilities. . . . Underground-storage expenditure in same period estimated at $134,000,000. . . . Proved reserves at first of 1953, A.G.A. says, were 199.7 trillion cubic feet, up 5.9 trillion cubic feet over 1952. . . . Production in 1952 reached all-time high at 8.6 trillion cubic feet, but discoveries and development again far more than filled the gap. . . .

PIPE LINES—Four companies seek Federal Power Commission authority to carry out $168,462,035 pipe-line project for transmitting more gas to Great Lakes region. . . . Biggest application, submitted by American Louisiana Pipe Line Co., covers construction of a 1,289-mile, 30-in. line from Acadia Parish, Louisiana, to near Detroit. . . . ¶Nevada Gas Pipe Line Co. completes 114-mile, 10¾-in. line from Topock, Ariz., to Las Vegas, bringing Nevada its first natural gas. . . .

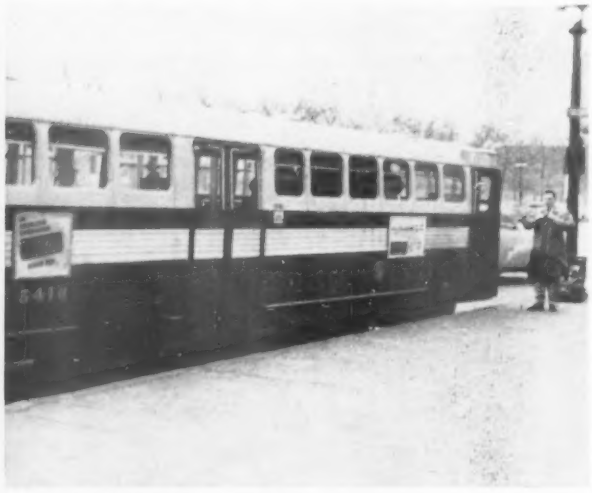
INTERNATIONAL—Gulf subsidiary suspends exploration in Denmark after six deep tests and many shallower wildcats over past 6 years. . . . Estimated $10,000,000 exploration program developed only noncommercial oil shows in two test holes. . . . ¶Petrochem plant adjacent to S.G.H.P. refinery at Lavera, France, placed in operation. . . . ¶Standard Vacuum reaches agreement with Indian Government covering further exploration of Bengal basin. . . . Government to put up 25 per cent of exploration budget. . . . ¶Six international companies disclose plans for joint exploration program in Libya, North Africa. . . . ¶Shell announces plans to dedicate 25,000-bbl. refinery near Melbourne March 18. . . .

GOVERNMENT—Congress returns to Washington this week faced with a heavy schedule in what is regarded as the "year of decision" for the Eisenhower administration. . . . The legislators are expected to consider bills to exempt natural-gas producers and gatherers from FPC jurisdiction as a direct result of the Supreme Court decision in the Phillips Petroleum Co. case. . . . Congress is expected to receive pressure for import quotas on foreign oil and the House commerce committee will probably resume its probe of last spring's price increases. . . . ¶Rhode Island joins Alabama in an effort to have the "tidelands" act declared invalid by the Supreme Court. . . .

ACTIVITY—Production of crude and lease condensate averaged 6,260,400 bbl. daily for week ended December 26, up 6,650 bbl. daily. . . . ¶Total well completions for the week dropped 61 wells to 988. . . . Wildcat completions decreased 30 wells to 204. . . . ¶Rotary rigs operating in the United States dropped to 2,632 for December 28 compared with 2,885 on December 21 and 2,628 on corresponding date last year. . . .

TRENDS—Indicated demand for distillate fuels for the 3-week period ended December 19 was almost 9 per cent less than for the same weeks last year. . . . Refinery production of distillate was about 1,050,000 bbl. less than for the same weeks in 1952, but the stock reduction was under last year by 2,800,000 bbl. . . .

FARM CONSUMPTION of L.P.G. maintained its steady climb as machines continued to replace manual and farm-animal labor.



L.P.G. FUELED BUSES continued to increase, with an estimated 2,000 in operation by the end of 1953.

NEW TRANSPORTATION application is this L.P.G.-fueled locomotive, being tried experimentally by Union Pacific.

NEW AGRICULTURAL USE is L.P.G. installations for curing tobacco. Together these uses made 1953 another record year.

L.P.G. Records Fall by Wayside

- **Total sales reach almost 5 billion gallons, up 10 per cent over 1952.**
- **Production capacity surges 550,000,000 gal. per year with the addition of 15 new gasoline plants.**
- **Storage situation, long the industry's knottiest problem, at year end regarded as most favorable in history.**

BARTLESVILLE, Okla. — The ballooning L.P.G. industry had another banner year in 1953, hiking sales roughly 10 per cent over 1952 an estimated 4,920,000,000 gal. and setting a new high for the thirty-second consecutive year.

The increase in sales came to almost 443,000,000 gal. — about double the gallonage boost in 1952.

These estimates were made last week by Phillips Petroleum Co. in the company's annual year-end report on L.P.G. progress. The 1953 report was prepared by George R. Benz, manager, and Paul W. Tucker, technical representative, of Phillips' engineering department.

The almost 5 billion gallons sold last year illustrates more clearly the tremendous expansion undergone by the L.P.G. industry when compared with 1922, the first year in which sales were recorded, when a mere 223,000 gal. was sold.

Though the big gains percentagewise

were chalked up in earlier years, the actual large-volume increases have come during the past 10 years. In 1943, sales of L.P.G. totaled only 675,233,000 gal. —not much more than last year's increase in total sales.

Further increases in sales volumes during 1954, the authors said, should result from increases in L.P.G. production and expansion of transportation facilities, together with added emphasis on sales.

Domestic and motor fuel . . . Sales of L.P.G. for domestic use and as fuel for internal-combustion engines increased nearly 300,000,000 gal., or 11.2 per cent, over 1952 to a new peak of 2,932,000,000 gal., Benz and Tucker estimated.

The gain would have been considerably greater except for above-average temperatures which prevailed through most of the year and especially during the first and last quarters. In spite of this, the industry enjoyed a good summer from the sales standpoint for these reasons:

. . . A tremendous volume of L.P.G. was sold in the Southwest in connection with irrigation operations.

. . . Tractor-fuel use increased substantially.

. . . More product was stored by both customer and bulk distributors, doubtless reflecting to some extent the success of promotional campaigns carried on by the industry advocating larger storage.

Use of L.P.G. for house heating has continued to increase, especially in the central and northern regions, the report said. Shipments of floor, space, and wall type L.P.G. furnaces totaled more than 400,000 last year, representing almost 20 per cent of all such gas-fired appliances. About 450,000 ranges were shipped for use with L.P.G., roughly 2 per cent over 1952. Although the ratio of gas-range sales to electric-range sales dropped from about 2:1 to about 1.5:1, the trend in water-heater sales was just the reverse.

L.P.G. use on the farm has continued to become more diversified. Present uses are for tractor fuel, stock-tank heating, brooder-house heating, flame weeding, milk-house use, and as fuel for stationary engines, as well as for home heating. This, the report said, indicates a desirable trend toward increasing consumption per installation.

L.P.G. also continued during the year to replace other fuels as the source of heat in the tobacco industry's dehydrating operation, especially in the Connecticut River Valley and in the Carolinas.

The report placed the volume of L.P.G. used as engine fuel at nearly 500,000,000 gal. last year, about 10 per cent of the total. Spot surveys, it said, indicate that consumption of L.P.G. as internal-combustion fuel in certain sections of the South and Southwest accounts for up to 50 per cent of total sales.

A recent survey indicates that about 2,000 buses will be operating on L.P.G. by the end of 1953, according to Benz and Tucker. One more major tractor manufacturer has announced the start of production of two of its tractor models factory-equipped to use L.P.G. as fuel. A major truck manufacturer has extended its line of L.P.G.-fueled trucks to some of the smaller models, and production of another major gasoline carburetor was begun during the year along with two new L.P.G. motor-fuel dispensers.

Taxi companies, the report said, are exhibiting a growing interest in L.P.G. as fuel due principally to longer engine life, less maintenance and oil consumption, and better performance.

One of the year's surprises was the sudden interest in L.P.G. as fuel for industrail tractors on lift trucks. Sev-

Marketed L.P.G. Production, 1922–1953

(Thousands of gallons)

Year	Total sales	Domestic and motor fuel*	Industrial and misc.†	Gas mfg.	Chemical mfg.	Rubber components‡
1922	223	Sale of liquefied petroleum gas confined primarily to bottled gas business prior to 1928				
1923	277					
1924	376					
1925	404					
1926	465					
1927	1,091					
1928	4,523	2,600	400	1,500		
1929	9,931	5,900	1,500	2,500		
1930	18,017	11,800	2,200	4,000		
1931	28,770	15,295	7,172	6,303		
1932	34,115	16,244	8,167	9,703		
1933	38,931	16,626	13,987	8,318		
1934	56,427	17,681	32,448	6,298		
1935	76,855	21,380	47,894	7,581		
1936	106,652	30,014	67,267	9,371		
1937	141,400	40,823	62,610	11,175	26,792	
1938	165,201	57,832	62,694	12,386	32,299	
1939	223,580	87,530	93,723	15,435	26,892	
1940	313,456	134,018	124,482	20,285	34,671	
1941	462,852	220,722	172,669	25,255	44,206	
1942	585,440	303,857	197,179	31,366	53,038	
1943	675,233	344,962	237,396	37,519	55,356	
1944	898,071	445,617	254,590	45,879	151,985	
1945	1,067,979	533,262	256,577	53,849	224,291	
1946	1,410,370	758,466	253,745	86,660	311,499	
1947	2,209,797	1,150,538	274,125	169,332	414,267	201,535
1948	2,736,801	1,473,289	275,883	237,638	525,4350	225,641
1949	2,836,599	1,627,550	247,103	239,210	544,886	177,850
1950	3,482,567	2,022,464	355,456	251,694	624,468	228,485
1951	4,227,275	2,456,804	269,408	281,692	844,507	374,864
1952	4,477,379	2,636,736	338,959	259,697	870,990	370,997
1953	4,920,000	2,932,000	326,000	247,000	1,016,000	399,000

*Household use plus other requirements by these customers such as irrigation pumping, tractor fuel, flame weeding, chicken brooding, and similar uses. Included also is L.P.G. sold by domestic distributors but used for industrial purposes. Included also, in 1951, 1952, and 1953 only, is L.P.G. sold direct by producers and marketers solely for fueling internal-combustion engines. †Includes L.P.G. sold for refueling internal-combustion engines for all years prior to 1951, and all sold for chemical manufacturing prior to 1937. ‡L.P.G. used for manufacture of synthetic-rubber components is included in this report for first time this year.

Remarks: In this table total sales for all years except 1953 were obtained from U. S. Bureau of Mines reports. Distribution for the years 1931 to 1952, inclusive, was obtained from the same source. All other volumes were estimated by the writers. The total sales volume includes all L.P.G. (propane, butane, and propane-butane mixtures) when sold as such. Until 1944 the sale of pentane when sold for any purpose other than motor-fuel blending was included. Since then it has been excluded. It does not include butane when blended with heavier petroleum fractions for motor-gasoline purposes. Intercompany sales transactions such as purchases of L.P.G. by one company from other companies and resold as L.P.G. have been eliminated in order to avoid duplication of sales figures.

eral manufacturers currently are offering L.P.G. models of this type of vehicle.

Industrial and miscellaneous . . . Volumes of L.P.G. consumed last year in the combined industrial and miscellaneous categories was placed in the report at 326,000,000 gal. This was a drop of about 2.9 per cent.

An increase in miscellaneous uses compensated somewhat for a drop in the industrial use of about 5 or 6 per cent. The principal reason for the sharp drop in industrial applications was the extension and expansion of natural-gas transmission systems during the year. In addition, relatively mild weather made it unnecessary for industry to operate standby L.P.G.-fueled facilities in many cases.

Railroads are expressing an active interest in L.P.G. flame weeding of rights-of-way after preliminary studies and trials indicated that it is cheaper than chemical treating. They also are watching with interest an experiment of Union Pacific with an L.P.G.-fired turbine locomotive, the report said.

Chemical manufacture . . . One of the biggest developments of the year for the L.P.G. industry was the sharp 16.6 per cent gain in the volume consumed as raw material for the manufacture of chemicals and chemical intermediates.

This pushed sales for this purpose to an estimated 1,016,000,000 gal. from about 870,990,000 gal. in 1952.

Many factors contributed to this increase, the report said. Several large plants went on stream late in 1952 and were in operation during all of 1953, while others started up early last year and were in operation most of the year. An increased supply of refinery gases containing L.P.G. resulted from higher refinery runs of crude oil and deeper cracking of the medium and heavier fractions. Demand for petrochemicals was even stronger during the year and numerous compounds became available for the first time in tank-car quantities.

Strong competition for the petrochemical raw-materials market was seen in the report from methane and ethane, especially the latter. Polyethylene, the report said, is probably the fastest growing of all petrochemicals, and ethylene required for its manufacture can be produced by cracking either ethane or L.P.G.

L.P.G. as raw material for the manufacture of synthetic-rubber components increased 7.5 per cent to 400,000,000 gal. annually.

Utility use . . . Roughly 247,000,000 gal. of L.P.G. was used last year in gas manufacturing as compared with a consumption of about 259,697,000 gal. in 1952.

Here again, the report said, the decrease, which amounts to about 5 per cent, was due to changeovers to natural gas and above-average temperatures which prevailed over most of the country.

Supply . . . The production branch of the industry more than took care of the 1953 sales increase of nearly 450,000,000 gal. with the addition of 15 new natural-gasoline plants during the year with an estimated production capacity of 550,000,000 gal. annually. One of the biggest of the new plants was the National Petro-Chemical Corp. installation at Tuscola, Ill.

Substantial production during the year was curtailed by the Texas Railroad Commission's order effective April 1 shutting down operations in the major portion of the huge Spraberry Trend Area field in West Texas.

The report estimated that at least 12 new plants with a total capacity of more than 220,000,000 gal. will begin operating this year. The plants include two in Canada and one in the Williston basin in North Dakota.

The percentage of L.P.G. produced in refineries as compared with total production continued to shrink last year. Five years ago, the report said, 33.3 per cent of all L.P.G. came from refineries. This year the refineries' share will be about 28 per cent.

Storage . . . The L.P.G.-storage picture, according to Benz and Tucker, is brighter perhaps than it has ever been. Present underground-storage capacity, they estimated, is over 205,000,000 gal. in 67 completed projects. Another 76 projects, with a capacity of more than 285,000,000 gal., are either under construction or being considered. Though there are several mined caverns, by far the largest portion of underground-storage capacity has been and is continuing to be washed out of salt domes and formations.

Though storage capacity is growing rapidly, the authors said, the added storage does not obviate the necessity for continuing to emphasize adequate consumer storage, new and increased summer loads, and planned deliveries.

Transportation . . . There are now 23,500 high-pressure tank cars in service, the authors estimated. About 7,000 are in chemical service, the remainder are L.P.G. cars. About 2,100 new L.P.G. cars were added during the year. The search for lower-cost transportation, however, is continuing. A new sea-going L.P.G. barge, the first in the industry to haul L.P.G. exclusively, was launched recently to carry products to Florida and Cuba.

Both truck and pipe-line movements during the year increased. An especially big increase in truck movement was attributed largely to the completion of new underground-storage projects.

Exports . . . Exports of L.P.G., going principally to Canada and Mexico, are expected to amount to nearly 120,000,000 gal., nearly 30 per cent over 1952. Exports are not included in total sales figures or in the accompanying table.

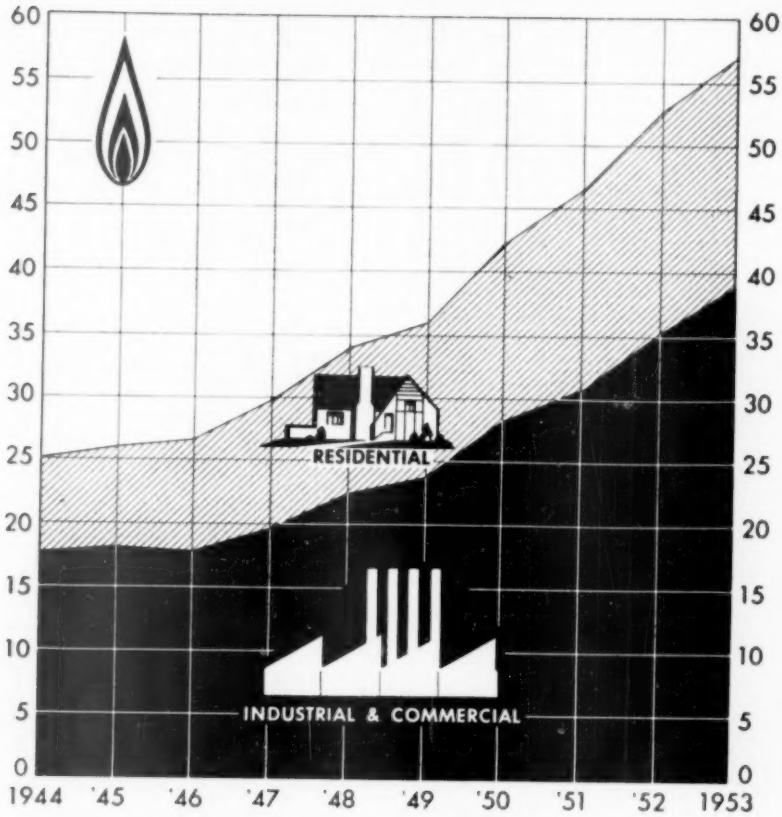
Safety . . . The continuing expansion of the industry has made it necessary to revise and enlarge safety standards to keep pace. Substantial gains were made in this direction last year, and further advances are expected this year.

The National Fire Prevention Association, due to the growth of the L.P.G. motor-fuel market, currently is considering adding a section exclusively devoted to L.P.G. filling stations to the N.F.P.A. No. 58. Other changes in the standards reflect the rapidly growing interest in the use of L.P.G. as fuel for industrial tractors and lift trucks and for truck cargo heaters. Standards have been completed covering the joint storage of L.P.G. and inflammable liquids.

The American Gas Association recently completed a comprehensive review and revision of its Pamphlet No. 59, covering the use of L.P.G. at utility gas plants. The American Petroleum Institute's L.P.G. committee is making considerable progress, the authors said, in the development of standards for the design and construction of L.P.G. facilities at natural-gasoline plants, refineries, tank farms, pipe lines, and marine terminals.

Outlook . . . From all indications, the authors said, 1954 should be an even better L.P.G. year. The industry is in an excellent position, they said, to expand sales further. Recently completed manufacturing facilities are in full-scale production, and new plants will come on stream this year. All forms of L.P.G. transportation (truck, pipe line, rail, and water) have been expanded greatly. Producers' plant storage has been boosted materially by addition of underground-storage facilities. Steel for tanks and equipment should be more than adequate.

Emphasis during 1954 will be on expansion of sales. The drive for new business will be not only to secure new L.P.G. customers, but also to establish new "load building" uses with existing customers. The latter aim is expected to be an important factor in the industry's future growth.



SOARING GAS SALES by utilities reached almost 57 billion therms last year, up 8.1 per cent. Natural-gas sales were over 53.5 billion therms.

Huge Pipe-Line Outlay

Gas industry to pour nearly $2 billion into expansion of U. S. natural-gas-transmission facilities in next 3 years

NEW YORK.—Nearly $2,000,000,000 will be spent during the 3-year period from 1954 through 1956 for natural-gas transmission facilities, Earl H. Eacker, president of the American Gas Association, predicted last week.

This huge expenditure, Eacker said in the annual A.G.A. year-end report, will represent the major portion of an estimated $2,500,000,000 to be spent during the 3 years on expansion of the entire natural-gas industry.

Eacker, also president of Boston Consolidated Gas Co., said mileage of natural-gas gathering, transmission, storage, and distribution lines in the United States now totals roughly 394,000 miles.

Natural-gas pipe-line projects totaling 8,000 miles were approved by the Federal Power Commission in 1953, he said. Projects aggregating 5,000 miles were completed, the rest either under way or starting at the end of the year. Applications for several thousand miles of additional lines were awaiting action by FPC at the start of the new year.

Lines reach new areas . . . During the past year gas was delivered to Massachusetts, New Hampshire, and Connecticut in volume, augmenting supplies in such New England cities as Boston, New Haven, and Hartford. Rhode Island received its first natural gas, and a proposed extension in New England would bring gas to Maine. First deliveries to Nevada were imminent at year end.

The only large region in the United States which gas lines have not penetrated is the Pacific Northwest. FPC will resume hearings January 4 on competing proposals by Westcoast Transmission Co. and Pacific Northwest Pipe Line Co. to construct lines into this area from gas fields in Alberta and in the San Juan basin of New Mexico and Colorado.

Several new lines are slated for construction within the next 2 years. American-Louisiana Pipeline Co. plans to lay a 1,200-mile, 30-in. transmission line to carry more gas from Texas to Michigan at a cost of about $130,000,000. Completion of the big Gulf Interstate Gas Co. line will bring additional gas from the Gulf Coast region to Kentucky and West Virginia for Columbia Gas System. Other applications have been filed with FPC to bring additional supplies to the metropolitan areas of New York, Philadelphia, and Newark, N. J.

Underground storage . . . A.G.A. estimates that more than $134,000,000 will be spent on underground-storage facilities from 1953 through 1956.

At the end of 1952, Eacker said, there were 151 underground-storage pools in operation in the United States with a total estimated capacity of 1,290 billion cubic feet. Roughly 281,500,000 cu. ft. of underground-storage capacity will be added by 17 additional storage projects under construction during 1953.

Reserves . . . Proved reserves of natural gas by the first of 1953 totaled 199.7 trillion cubic feet, A.G.A. estimates, 5.9 trillion cubic feet over the association estimate a year earlier.

Production in 1952 reached an all-time high of 8.6 trillion cubic feet, but discoveries and expansions of previous reserve estimates in known pools again more than made up for the tremendous increase in yearly production. Discoveries alone in 1952 added about 5.4 trillion cubic feet to the nation's proved reserves, as compared with about 3 trillion cubic feet in 1951.

Sales, revenues, customers . . . Sales of natural gas in 1953 set a new record of 53.563 billion therms, up 8.6 per cent over the previous year, A.G.A. said.

Revenues from sales of natural gas increased 15.7 per cent to total $2,268,000,000, which also was a new all-time high.

More than 20,600,000 customers were receiving natural gas at the first of the year, a gain of 6.5 per cent over the number at the first of 1952. In addition, gas utilities were serving

Here's How Gas Industry Fared in 1953

	1953	1952	Per cent Increase
Customers (average)			
Residential	18,368,000	16,891,900	8.7
Commercial	1,506,000	1,377,400	9.3
Industrial	73,000	67,000	9.0
Other	21,000	21,200	
Total	19,968,000	18,357,500	8.8
Sales (thousands of therms*)			
Residential	15,679,000	15,253,900	2.8
Commercial	4,597,000	4,392,800	4.6
Industrial	30,485,100	27,272,700	11.8
Other	2,801,500	2,373,800	18.0
Total	53,562,600	49,293,200	8.7
Revenues			
Residential	$1,232,891,000	$1,094,641,000	12.6
Commercial	275,918,000	239,901,000	15.0
Industrial	706,009,000	580,558,000	21.6
Other	53,810,000	45,689,000	17.8
Total	$2,268,628,000	$1,960,789,000	15.7

*A therm is 100,000 B.t.u. or the heat equivalent of roughly 100 cu. ft. of natural gas.

about 300,000 customers directly with L.P.G., together with about 6,500,000 others in areas not located on utility gas mains.

Natural gas continued to grow in popularity at the expense of manufactured or mixed gas. In contrast to gains chalked up by natural gas, manufactured or mixed gas customers declined 6.8 per cent to about 6,300,000, sales dropped 1 per cent to 3.290 billion therms, and revenues were down 7 per cent to $452,000,000.

The gas industry today, A.G.A. says, has more than $11.5 billion invested in plant and facilities, with total capital assets of more than $13.3 billion. During 1953, about $1.2 billion was spent by the industry for new construction and expansion of present facilities.

Industry Briefs

PORT CREDIT, Ont. — Trinidad Leaseholds (Canada), Ltd., has signed a licensing agreement with Universal Oil Products of Des Plaines, Ill., for the construction of a 1,500-bbl. per day Platforming unit at the company's 7,000-bbl. per day refinery at Port Credit, Ontario.

VANCOUVER, B. C.—An agreement of Shell Oil Co. officials to join union leaders in a 60-day study of employe demands ended a 12-day strike of refinery workers here last week. The 200 employes walked off after demanding wage increases and other benefits.

LONG BEACH. — Based on 11-month figures, this city's income from tidelands oil is expected to exceed $29,000,000. Long Beach Oil Development Co., largest contract-operator of city properties in the Long Beach Harbor area, will have a revenue of about $21,500,000. Richfield Oil Corp.'s contract will yield approximately $7,700,000. In addition city properties in upland oil fields are expected to yield $1,670,000.

EDMONTON, Alta.—No bids were offered on six northwestern Alberta crown reserve tracts offered for lease here last week. The office of the director of mineral rights had anticipated a quick response to the offering and gave no explanation for the failure of operators to submit bids.

BATON ROUGE, La.—Louisiana's January production allowable will be 666,427 bbl. daily, an increase of 6,795 bbl. per day over December, according to John B. Hussey, state conservation commissioner.

LONG BEACH.—Richfield Oil Corp. expects to complete by March 1 its new $600,000 building here to give its southern division exploitation, geological, and pipe-line departments new headquarters. Also to be located on the 18-acre tract is a $100,000 pipe yard and related facilities.

REGINA, Sask.—Saskatchewan's new regulations governing production allowables will go into effect January 31. The regulations, the first governing oil output allowables, will set the maximum rates for producing wells.

SARNIA, Ont.—Canadian Oil Co.'s new refinery here is now supplying the Canadian government with aviation gasoline—the first to be produced in Eastern Canada since the war. The company's 3,800-bbl. per day Platforming unit, the first in Canada, is contributing most of the high octane blend stocks for the avgas.

Kansas Hikes Allowable

WICHITA.—The Kansas Corporation Commission has set the state's January crude-oil production at 315,000 bbl. daily, an increase of 20,000 bbl. per day over that in effect the preceding 2 months.

During November and December the allowable was held at 295,000 bbl. daily in order to ease the oversupply situation. However, Kansas independents petitioned the commission recently not to set allowables in prorated areas below the minimums permitted by state conservation statutes. The new allowable reinstates minimum output per well to 25 bbl. daily.

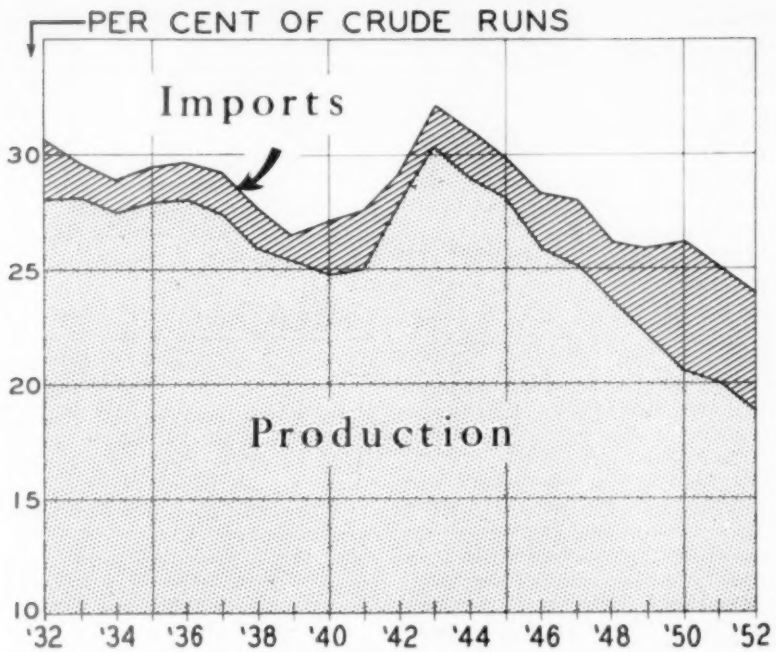
The Bureau of Mines estimates the January demand for Kansas crude at 324,000 bbl. a day. Purchasers entered nominations of 311,246 bbl. per day for the month, an increase of 10,200 bbl. daily over the December totals of 301,046 bbl. per day.

Water Flood Permit Asked

AUSTIN.—Four operators of seven leases in South Ward field, Ward County, are seeking Railroad Commission permission to water flood the 2,300-ft. Yates sand underlying their leases.

Walter O. Ford, Jr., representing Barron Kidd, Hamilton Brothers, Haynes & N. T. Drilling Co., and N. C. R. Oil Co., told the commission the leases now have 29 wells producing an average of 5.3 bbl. daily.

Ford estimated the flood will increase ultimate recovery by about 320,000 bbl.



Heavy-Fuel Decline

Yield now down to 18 per cent of the crude barrel; reason is railroad dieselization and competition from natural gas

HEAVY fuel oil, the ugly duckling of the refining industry, is playing a steadily diminishing role in domestic operations.

The yield of this low-valued fraction of the crude barrel gradually declined from the 30 per cent peak during the last war to 18.8 per cent in 1952, and incomplete figures for 1953 indicate that the figure is now 18 per cent or less.

In a recent statement before the Senate's minerals, materials, and fuels economic subcommittee, H. G. Burks, Jr., executive vice president of Esso Standard Oil Co., said the pattern of heavy-fuel use is steadily changing to reflect variations in supply sources, economics, transportation, and new developments in mechanical design.

Dominant factors in the decline in heavy-fuel demand during the past few years are the dieselization of railroads and the competition from natural gas.

On the other hand, this fuel has its own peculiar advantages which enhance its value to particular users, being preferred for vessels' bunkers, for utilities and industrial plants and for space heating of large buildings.

"This dynamic interplay of competing factors has resulted in the pattern of heavy fuel oil supply and demand which we have today—a demand made up of thousands of consumers, large and small, and serviced by a distribution system developed mainly by a large number of independent jobbers and distributors," said Burks.

"Earlier this year, we conducted a detailed survey of our company's heavy fuel oil customers. This survey developed that, exclusive of marine customers, we were serving directly a total of 3,287 consumers. More than 97 per cent of these on-shore consumers, representing 73 per cent of the total volume of our heavy fuel oil sales to such customers, were not equipped to switch to another type of fuel should heavy fuel oil supplies be cut off. The principal consumers in position to convert readily to alternate fuels are in the utility group. This group as a whole in 1952 consumed about 16 per cent of the total heavy fuel oil consumption in the United States (excluding bunkers for vessels) and less than 22 per cent of such total consumption along the eastern seaboard.

End uses . . . Total domestic demand for heavy fuel oil in recent years has leveled off at slightly over 1,500,000 bbl. per day. Fluctuations in end uses are illustrated in the accompanying table based on Bureau of Mines data. The demand from railroads, which declined to 109,000 bbl. per day in 1952, is steadily dropping, and it is anticipated that it will continue to decline as the dieselization program of the railroads progresses.

Bunker-fuel demand has fluctuated within a relatively narrow range in the post-war period, reflecting generally the variations in coastwise and international commerce, said Burks. Consumption by utilities has dropped off from the 1950 peak, as a result of increased competition from natural gas as well as from coal.

Burks pointed to the steady growth in the use of heavy fuel oil for industrial use and space heating. This indicates a preference of this type of fuel in certain areas.

Sources of supply . . . The steadily declining yields of heavy residual fuel oil has essentially offset the postwar gain

Heavy Fuel Oil Demand in the United States

(Thousands of barrels daily)

Year	Railroads	Vessel bunkers	Gas and electric power plants	Industrial use*	Space heating	Oil company use	Military and misc.	Total
1937	186	196	64	189	97	115	45	892
1938	154	168	65	150	99	117	47	800
1939	167	179	77	167	107	132	57	886
1940	177	168	77	182	123	139	63	929
1941	221	155	92	214	128	148	93	1,051
1942	274	104	77	232	130	123	172	1,112
1943	319	170	85	231	117	129	229	1,280
1944	313	252	94	237	111	151	241	1,399
1945	308	275	95	250	120	157	229	1,434
1946	275	242	140	271	136	159	92	1,315
1947	267	277	167	315	155	172	66	1,421
1948	245	262	155	322	160	155	69	1,368
1949	174	245	219	336	166	142	77	1,359
1950	167	255	255	406	199	146	89	1,517
1951	151	293	193	431	209	148	121	1,546
1952	109	302	193	433	216	149	117	1,519

*Includes only smelters, mines and manufacturing.

of nearly 41 per cent in total crude runs in domestic refineries to result in a relatively constant production of heavy fuel in this country. In seven postwar years the average production has been 1,258,000 bbl. per day and in no year has production varied more than 81,000 bbl. per day from that average.

In order to meet the demand for this fuel, said Burks, increased quantities of fuel oil were needed, both as bonded bunker fuel for vessels in international trade and for on-shore consumers. The trend toward minimizing residual yields in this country is extremely important, he said, from the standpoint of conservation of crude reserves within the United States.

He cited as an example the 1952 production of heavy fuel oil. Had the yield equalled the 25.9 per cent realized in 1946 instead of 18.9 per cent, the crude requirement for lighter liquid products would have exceeded refinery runs in 1952 by about 700,000 bbl. per day. This, he pointed out, would have consumed a substantial portion of the emergency reserve crude producing potential of a million barrels per day now estimated as available by Petroleum Administration for Defense.

On the basis of domestic crude runs, the production of residual fuel oil in U. S. refineries plus imports has declined in all but one postwar year, Burks said.

Burks stated that crude reserves in Venezuela and other friendly countries are ample to assure the continuing availability of heavy fuel oil. These sources of heavy fuel oil outside the United States proved to be indispensible in two world wars and would be necessary in the event of another such emergency, he concluded.

Completion Symposium Set

HOUSTON.—A symposium on the new "permanent type" well completions will be held January 12 at the University of Houston. The event is sponsored by the Gulf Coast section and the university chapter of the American Institute of Mining and Metallurgical Engineers and the university engineering department.

Papers and speakers will include: "Comparison of the Permanent Well Completion System with Conventional Completion Methods," C. V. Kirkpatrick, University of Houston; "Tubing Type Gun Perforator, Logging Services, and Associated Equipment," Reid Hogson, Schlumberger Well Surveying Corp.; "Wire Line Operations, Tubing Extension, and Associated Equipment," H. B. Schramm, Otis Engineering Corp.; "Experience with Permanent Well Completion System," T. A. Huber, Humble Oil & Refining Co.; and "Objective View of Permanent Well Completion Technique," Roscoe Clark, Continental Oil Co.

Several service and equipment firms have been asked to set up exhibits, and a typical well will be rigged for wireline operations, with all surface equipment in place.

The new technique was developed by Humble.

Gulf Plans "774" Wildcat

GALVESTON.—Gulf Oil Corp. has asked the Army Corps of Engineers for permits to drill three offshore tracts in the Gulf of Mexico—one of them State Tract 774 for which Gulf paid a record $3,065,880 in Texas' largest lease sale last month *(The Oil and Gas Journal, December 14, page 98)*.

The northwest corner of the 5,760-acre tract is 5 miles from the southeast beach of Mustang Island. The other two tracts, 640 acres each, are State Tracts 889 and 898 about 15 miles southeast of Aransas Pass.

Gulf has declined to comment on the possibility that its extensive geophysical work in the area has found a new structure akin to the nearby prolific Mustang Island fault. The company had previously declined to reveal what if any drilling plans it had. However, Gulf informed the Engineers it plans to use a 48-by-106-ft. drilling platform standing 48 ft. above low tide. Depth of the water in the tract area ranges from 30 to 40 ft.

ROCKY MOUNTAIN

Development Deal Made

FORT WORTH.—Southern Production Co., Inc., has entered into an exploration and development agreement with Texota Oil Co. covering 200,000 acres of oil and gas leases held by Texota in the Williston basin.

Under terms of the agreement, Southern Production will acquire an undivided one-half interest in the leases with the provision that complete seismic surveys of all the leases are to be begun immediately and an exploratory program based on survey results is carried out.

Dunn County Test Finds Oil

BISMARCK, N. D.—A significant rank wildcat in Dunn County last week recovered 415 ft. of 32°-gravity oil on a drill-stem test between 9,018 and 9,066 ft.

The test is the 1 Lockwood of Carter Oil Co., Sinclair Oil & Gas Co., and Socony-Vacuum Oil Co., Inc. It is about 20 miles southeast of Nesson anticline production, 60 miles northeast of Amerada Petroleum Corp.'s Fryburg area discovery in Billings County, and is the easternmost important oil show in western North Dakota.

The zone tested is in the Mission Canyon, topped at 8,773 ft.

CANADA

Firm Sells Gas Subsidiary

CALGARY, Alta.—British Dominion Oil Co., Ltd., has sold its wholly owned subsidiary, Stettler Gas Co., to Alberta Consolidated Gas Utilities, Ltd. of Edmonton, according to an announcement by T. L. Brook, president.

Included in the $550,000 sale is the pipe line from Stettler gas field and the distribution system in the town of Stettler. The company will retain its gas wells and will continue to deliver gas to the Stettler company Brook said the sale will make possible an accelerated drilling program by British Dominion in Etzikom field and the Peace River area.

Canadian Shell Formed

In a streamlining of its internal corporate structure, Royal Dutch-Shell has organized Canadian Shell, Ltd., to hold the major portion of its Western Hemisphere investments.

Canadian Shell will obtain ownership of the major investments of the Shell group companies in Venezuela. It also will acquire ownership of Caribbean Petroleum Co., the New Jersey corporation which owns beneficially 65.44 per cent of the outstanding stock of Shell Oil Co., and will hold a 50 per cent interest in Shell Oil Co. of Canada.

The new company is chartered in Ontario and has an authorized capitalization of $200,000,000. A staff is now being assembled for the headquarters at 600 University Avenue, Toronto. The change is purely an internal reorganization not involving any public financing.

Petrochem Plant Expanding

EDMONTON, Alta.—Canadian Industries, Ltd., plans to increase by one-third the capacity of its polythene plant which only went into production last month.

Plans call for a $1,000,000 expansion to add new equipment during 1954 to increase capacity of the plant to 16,000,000 lb. of polythene a year.

Here's What Congress Faces

In addition to administration program on taxes, labor, foreign trade and agriculture, Congress may consider:

- **Legislation to exempt natural-gas producers and gatherers from FPC jurisdiction**
- **Writing into law that a showing of good faith is a defense to charges of price discrimination**

Bertram F. Linz

WASHINGTON.— Congress returns to Washington this week with a short session and a heavy schedule ahead of it.

This is the "year of decision" for the Eisenhower administration in which it must enact the legislation for which in its first year of power it merely paved the way. The measures approved in the next 6 or 7 months will go far toward determining whether it will retain, improve, or lose the slender majority it now has in Congress.

Already, on the basis of conferences held last month by the President with his congressional leaders, the pattern of the coming session has emerged. It is expected to be more definitely outlined in the state of the union message which the President submits to Congress this week.

The President will ask the enactment of four major programs—taxes, labor, foreign trade and agriculture. He will probably call for other major legislation, on social security, the minimum wage and an increase in the national debt limit. Congress itself is working on other matters, such as reorganization of the postal service and clarification of the antitrust statutes.

Much of this legislation will affect the oil and gas industry, but it has an even greater stake in other actions Congress may take in coming months.

Price probe to resume . . . Resumption of the House commerce committee's investigation of last spring's price increases is indicated, spurred by the current over-supply situation. The committee also may go into the world oil situation on the basis of recent visits by some of its members to foreign petroleum-producing areas.

The Senate interior subcommittee, headed by Sen. George W. Malone of Nevada, will continue its investigation of the wartime availability of oil and strategic minerals. Sometime during the session the committee will make a report recommending construction of a prototype oil-from-shale plant as a blueprint for establishment of a synthetic liquid fuels industry in the event of an emergency.

Legislation definitely exempting natural-gas producers and gatherers from Federal Power Commission jurisdiction is expected to be introduced as a result of the Supreme Court's refusal to review the lower court decision in the Phillips Petroleum Co. case.

"Good faith" defense . . . Another effort may be made to write into statute the Supreme Court decision in the Standard Oil Co. (Ind.) case that a showing of good faith is an adequate defense against charges of price discrimination under the Robinson-Patman Act.

Congress may complete action on a bill passed by the House last year defining the conditions under which the Interstate Commerce Commission may amend, suspend or revoke water carrier certificates, including those for oil-carrying barge lines. It may also consider legislation to encourage the construction of more modern tankers and establish a reserve tanker fleet for use in the event of war. A bill has been requested by the Defense Department to permit the Military Sea Transport Service to enter into long-term charters of up to 20 years for oil tankers.

Also left over from last session are two proposals less likely of serious consideration. One would create a new agency on minerals and petroleum to take over the activities of the Interior Department in those fields. The other bill, introduced by Rep. John W. Heselton of Massachusetts, would establish well-to-pump federal control of the oil industry.

Finally, there is a possibility that the Treasury Department, while in no way attacking the desirability of depletion allowances as an incentive for the discovery and development of natural resources, may suggest that the 27½ per cent rate now allowed on oil and natural gas be reduced to more nearly the level of the allowances granted the other extractive industries.

The House ways and means committee is anxious to write an entirely new revenue bill—the first in some 20-odd years—but in view of the government's financial needs may not be able to set up permanent rates as it would like to.

The final elimination of the excess profits tax and the emergency increase in individual income rates has been permitted to take effect, but the President will ask either for another year's deferment of the 52 to 47 per cent reduction in the corporation tax rate and the easing of excise taxes, including that on gasoline, scheduled for next April or a compromise on the former at 50 per cent.

Against the administration's unwilling acceptance of the need to continue high taxes, a number of members of Congress believe the tax burden, particularly on individuals, should be further eased.

Economy to be pressed . . . The administration's economy drive will be pressed with full force, aiming at a reduction of not less than $5,000,000,000 in government expenditures during the fiscal year which starts next July 1. No encouragement is being offered for the initiation of any new expensive research projects in oil or other fields. The departments, in fact, may find their scientific work still further curtailed.

Extension of the social security act to workers not already covered by the law appears probable, but less probable is action on proposals to increase the present 75-cent minimum wage to 90 cents or $1 an hour.

Pressure on imports . . . Pressure for quotas on imports of foreign oil will be felt when Congress takes up the foreign trade program. The Senate banking committee, the Senate interior committee and the Randall Commission on Foreign Economic Policy are all expected to make reports on foreign trade within the next 2 months. The latter probably will be a split report in which a minority of the commission

will recommend strengthening the protection to domestic industry while the majority urges further liberalization of the reciprocal trade program.

Legislation amending the Taft-Hartley Labor Relations Act does not face fair weather and may not get through Congress this session, since it appears that any revision acceptable to Congress will not be satisfactory to labor and may not be entirely satisfactory to management.

Further reorganization of the government structure may be halted by Congress by failure to renew the authority to the President to shift the organization around.

Action is doubtful in the field of postal rate increases and clarification of the antitrust laws, because of the pressure of other legislation, and there is little likelihood that any other measures of less than primary importance will get any further than the discussion stage.

The new session of Congress will convene January 6. Leaders hope for adjournment early in July, but to get it they will have to streamline the program and work vigorously to pass the appropriation bills and the "must" measures, practically every one of which is highly controversial.

New Tidelands Suit

Rhode Island joins move to overturn offshore act

WASHINGTON.—The State of Rhode Island has lined up with Alabama in an effort to have last year's "tidelands" act invalidated.

The state last month asked leave of the Supreme Court to file suits against Texas, Louisiana, California, and Florida and against a number of government officials to restrain payment to the first three of about $65,000,000 in impounded royalties and revenues due them under the act restoring the states' historic seaward boundaries.

But while Rhode Island wants a cut of the offshore oil, it told the court it is also concerned over the implications of the tidelands act's recognition of the 10½-mile boundaries of Texas and Florida in the Gulf of Mexico.

International implication . . . Rhode Island fishermen, the state's brief pointed out, fish the waters of the Grand Banks which lie within "8 maritime miles" of the Newfoundland, New Brunswick, and Nova Scotia coast. If any extension of the traditional 3-mile limit is permitted to stand, the brief complained, Canada might also feel free to claim jurisdiction over the Grand Banks and bar Rhode Island fishermen from working there.

Alabama's effort to sue is based on the same grounds that the state has an interest in the impounded funds and in the submerged oil resources and might be adversely affected by the extended boundaries given the two other gulf states.

Justice objection . . . The Supreme Court is expected to announce a decision in the near future whether it will entertain the suits. The Department of Justice has filed an objection on the ground that the United States has not consented to be sued and cannot be sued without its consent, and that there is no law or statute supporting Alabama's claim that the federal Government is a trustee of the tidelands.

More Expansion Urged

Capehart says margin between defense needs and danger point can be wiped out by increased U. S. consumption

WASHINGTON.—Continued expansion of facilities in the oil and other war-supporting industries was called for last week by Sen. Homer E. Capehart of Indiana, chairman of the joint committee on Defense Production.

The committee concluded the industrial expansion program has reached a point where the nation is "able to sustain military production at current peak levels with very little dislocation of the nation's economy or civilian markets." Capehart pointed out, however, that the balance is delicate and any additional load would soon render some facilities inadequate even for the purposes of current programs because of supply and demand imbalances in critical materials.

"It will not be an easy task to maintain a long and continuing state of national readiness, yet the safety and security of the nation demand efforts and expense which at times seem oppressive," Capehart asserted. "So long as present dangers threaten the safety of our country, we dare not relax our vigilance."

Capehart's conclusions were supported by Interior Secretary Douglas McKay in a review of the activities of the Petroleum Administration for Defense.

Consumption increase . . . Although construction under way should meet all of the goals of the oil and gas industries by the end of 1955, the committee was told, the normal year-by-year increase in consumption will partly offset the increased productivity.

"Consequently," McKay reported, "the oil and gas industries must continue their normal expansion rate if a reasonable reserve capacity is to be maintained."

Furthermore, the committee was told, "the security of the United States is intimately bound up in that of the friendly foreign nations, and security today is dependent on an adequate supply of petroleum products."

A continuous study must therefore be maintained of the constantly changing international supply and demand figures, which must reflect the areas of potentially deficient supply and permit concentrated effort to alleviate or correct the deficiency.

Investment total . . . Investment in new facilities since July 1, 1951, is close to the $6 billion point, statistics in the PAD review indicate.

As of the close of the fiscal year last June 30, projects to cost $5,785,255,000 had been approved, including $2,392,966,000 for gas, $1,619,528,000 for refining, $1,244,852,000 for supply and transportation, $437,301,000 for natural-gas processing, $25,896,000 for marketing and $64,712,000 for production. As of last August 28, accelerated amortization had been approved for facilities valued at $3,849,688,000 for an average quick write-off of 49 per cent of their cost.

"Assistance in the procurement of materials is no longer permissible or necessary," the Capehart committee was told. "There is, however, one incentive which will be of assistance in encouraging further expansion. This is the incentive supplied by accelerated tax amortization.

There has been little need to make use of the direct defense-loan incentive and there would appear to be even less under the defense production act as presently extended."

Lease Renewals Streamlined

WASHINGTON.—The Bureau of Land Management will adopt a streamlined procedure next year for extending noncompetitive oil and gas leases beyond their initial term.

Effective January 25, the bureau will use a simplified form which, when

filled in by the lessee, will be referred to the Geological Survey for examination. The survey will indicate if the lease is in a known geological structure. If the lease is eligible for continuance, the land office manager will sign one copy of the form and return it to the lessee as his official 5-year extension.

Foreign Aid Urged

Technical assistance asked for underdeveloped nations

WASHINGTON.—Vigorous support of the technical cooperation program for the development of natural resources in underdeveloped countries was recommended to Foreign Operations Director Harold E. Stassen last month by the International Development Advisory Board headed by Eric Johnson.

The board urged support of the program both by granting of technical assistance and the encouragement of private capital investment.

The group warned, however, that technical assistance to underdeveloped countries is a long-range proposition and should not be permitted to become a "fad," to be pressed vigorously for a short time and then dropped. Nor is it desirable, Stassen was told, that foreign governments be led 'into the error of thinking they must have an outside expert to do anything of importance even though there may be competent persons available within the particular country to perform the desired service."

The report called for better coordination of the programs of the United States and the United Nations to eliminate overlap and duplication, and reforms in the latter's program to permit a more effective allocation of its funds. On the question of contributions, the board took the position the United States should not continue to provide 60 per cent of the total U.N. budget, but should cut its participation to 50 per cent over the next 5 years and then reassess the situation.

While Government can provide technical assistance to the underdeveloped countries, the board held, private capital with its accompanying management and technical skills can play an important role in economic and social development of those areas.

Private capital . . . The accomplishments of private capital, however, have not been of the order expected when Congress passed the Act for International Development in 1950.

As a result there have been many

WATCHING WASHINGTON

Bertram F. Linz

McKay Policies Eyed

Interior Department policies are expected to be the subject of much discussion during the coming session of Congress.

Secretary Douglas McKay's plans for encouraging the fullest development of the public lands for their oil, mineral, timber and other values will meet with considerable support. But his idea that much of the approximately 400,000,000 acres of government lands should be transferred to the states and private owners may be the signal for a new charge of "give away."

The administration's plans for the public lands might not of themselves arouse much partisan interest, but they are tied in with McKay's views on public power which already have created controversy. On top of that, the secretary's efforts to boost the development of Alaska's resources may have a bearing on the territory's effort to achieve statehood.

McKay himself believes that the agreement entered into last year with the Phillips Petroleum Co. for exploration and development in the Katalla-Yakataga area may result in the discovery of a major producing field. That contract is being backed up by a vigorous search by the department for oil possibilities elsewhere in the territory. If oil is found in substantial quantity he foresees a rapid expansion of Alaska's economy.

In the continental public lands, McKay feels he has a mandate to dispose of and integrate the Government's holdings with the private economy.

Reversal of 20 years of expansion of government influence is not proving to be an easy job. Wherever his actions involve oil or natural gas, McKay's policies will be closely scrutinized by public and self-appointed defenders of the consumer, who opposed return of the tidelands to the states and are seeking to put the whole natural-gas industry under government control.

FTC Studies Contracts

A broad study is being made by the Federal Trade Commission to ascertain whether major oil companies in the East and Midwest are entering into exclusive dealing contracts which violate the Clayton antitrust act.

The commission disclosed an investigation is already under way in response to a resolution of the National Oil Marketers Association calling for action against such agreements.

A precedent outlawing exclusive dealing contracts was set by the commission last year when a consent agreement was reached with the Shell Oil Co. under which the company agreed not to make exclusive-dealing sales or contracts for its kerosine and fuel oil.

The current investigation is expected to go into the marketing practices of all the major oil companies and if any are found of the type involved in the Shell case proceedings will be instituted for the issuance of cease-and-desist orders.

Investment Return High

American investments in foreign oil operations earned $1,013,000,000 in 1952 or close to half the $2,280,000,000 earned on direct investments abroad by Americans.

A Department of Commerce study indicates that the 1952 oil earnings were approximately $117,000,000 greater than those of 1951. The figures represent investments in refining and marketing as well as in production throughout the world.

The survey did not indicate how much of these earnings were remitted to the United States, but the department said remittances declined in 1952 for the first time since the end of the war, reflecting in part some impediments to the transfer of earnings by reason of exchange controls.

The department's figures showed that investments in Canada are beginning to show results, although the returns thus far have been of minor significance. The 1952 earnings in that area were estimated at $12,000,000, as compared with $3,000,000 in 1951.

Earnings on petroleum investments in Latin America increased from $409,000,000 in 1951 to $438,000,000 in 1952, and in Western Europe from $49,000,000 to $79,000,000. The greatest increase was in the Eastern Hemisphere exclusive of Western Europe, where earnings jumped from $436,000,000 to $483,000,000.

investigations and studies by both government and private organizations. The Department of Commerce has completed a study of the factors in foreign countries which limit United States investment and is now preparing reports of United States business opinion on impediments to private foreign investment and a general analysis of factors underlying impediments.

It was recommended that the Foreign Operations Administration encourage technical missions to underdeveloped countries along the lines of the Randall mission to Turkey which paved the way for the opening of oil exploration to foreign capital.

It was also urged that FOA immediately take the leadership in formulating specific proposals for dealing with the problems of foreign investment.

N.P.C. Will Continue

WASHINGTON.—The National Petroleum Council and the Gas Industry Advisory Council will continue as liaison between the industry and the Government under the Oil and Gas Division of the Interior Department.

The question whether the councils would be discontinued after the liquidation of Petroleum Administration for Defense was settled by Interior Secretary Douglas McKay by the appointment of members to serve through 1954.

All but four of the members of the NPC and all of the members of the gas council were reappointed.

The new members of the petroleum council are D. K. Ludwig, president of National Bulk Carriers, Inc.; W. A. Moncrief, Fort Worth, Tex.; John Ruan, president of National Tank Truck Carriers, Inc., and Sidney A. Swensrud, Gulf Oil Corp. They succeed William R. Boyd, Jr., Teague, Tex.; Col. J. Frank Drake, Gulf Oil Corp.; E. DeGolyer, Dallas, and R. S. Shannon, Pioneer Oil Corp., Denver, who have retired.

FRANK J. GARDNER

R. G. DEERING

EDWIN McGHEE

PAUL E. SWAIN

HARRY TAYLOR

Journal Expands Editorial Staff

FIVE experienced technical men and writers have been added to the editorial staff of The Oil and Gas Journal.

The additions represent an expansion program designed to enlarge the Journal's coverage of the news and technology of the petroleum industry.

The five are:

... **Dr. Frank J. Gardner,** president of Five Star Oil Report, Inc., Houston, who will join the Journal January 18 as exploration editor. He will succeed Philip C. Ingalls, who is resigning to join the geological staff of Socony-Vacuum Oil Co., Inc., New York.

... **Robert G. Deering,** who came to the Journal December 30 as assistant pipe-line editor. Deering formerly was with Sun Pipe Line Co., Beaumont.

... **Edwin McGhee,** formerly with Mene Grande Oil Co., Venezuela, who now is headquartered in the Journal's Tulsa office handling drilling and production material.

... **Paul E. Swain,** former assistant city editor and staff writer of the Daily Oklahoman, Oklahoma City, who has joined the Journal's central news staff in Tulsa.

... **Harry Taylor,** oil editor of the Shreveport Journal, who will become a member of the Journal's central news staff located in Tulsa January 11.

Gardner has headed the Five Star Oil Report organization since 1951. Before that he was chief geologist for Rinehart Oil News Co., with time out during the war for Army service as a petroleum analyst.

Before joining Rinehart, Gardner served 2 years as a geologist with the Texas Railroad Commission.

Gardner was valedictorian at William Adams High School in his home town of Alice, Tex., later was honored as the most outstanding student in geology at the University of Texas, where he also received the Joseph Cullinan scholarship in petroleum geology.

He received his bachelor of arts, cum laude, and his master's and doctorate degrees at Texas, his Ph.D. dissertation being "A Correlation of Characteristics of the Oil Fields of North and North Central Texas." He is a member of Sigma Gamma Epsilon and the Society of the Sigma Xi and is a fellow in the Texas Academy of Science. Gardner also is the author of 15 books for technologists in the petroleum industry.

Deering, a native of Burleson, Tex., is an engineering graduate of Texas A. & M. College. He comes to the Journal from Sun Pipe Line's Beaumont office, where his office and field work have been devoted principally to cathodic protection, automatic control, and electrical installations.

McGhee is a 1949 mechanical engineering graduate of Texas A. & M. College. He was associated for 2 years with Arkansas Fuel Oil Co., doing field work in Louisiana, Texas, and Arkansas. He then joined Mene Grande and spent 2 years in eastern Venezuela, working principally in the Greater Oficina and Jusepin areas. McGhee is a native of Brownwood, Tex.

Swain is a veteran reporter and writer, having spent 10 years with the Daily Oklahoman. Before joining the company, he was managing editor of the daily newspaper in Okmulgee, Okla., his home town. Swain is a graduate of the University of Oklahoma.

Taylor is a 1949 journalism graduate of Mississippi Southern College, Hattiesburg. Before service in the Navy during World War II, he studied petroleum engineering at Texas A. & M. College. He has been oil editor of the Shreveport Journal since 1950, having served before that on the editorial staffs of the Shreveport Times and the Jackson, Miss., Clarion Ledger.

World Output Drops

U. S. domestic production cut keeps output on downgrade; Kuwait snatches top producer's title from Saudi Arabia

Dahl M. Duff

THE third successive monthly decline in world production of crude oil occurred in October when average output dropped nearly 150,000 bbl. daily.

The decrease in total Free World production was due to a sharp cut in the United States. Domestic crude production fell some 296,000 bbl. daily, the largest decline in the U. S. since output was throttled back by the oil workers strike in May of 1952.

Foreign production registered a net gain, principally as a result of higher output in Kuwait, and Venezuela. Foreign production in October rose 146,900 bbl. daily, or 2.7 per cent, which in the world total was offset against the 295,700 bbl. daily, or 4.5 per cent, decline in the United States. Free World output, reflecting production both in the United States and non-Communist fields abroad, fell to 11,754,000 bbl. daily, its lowest level since last April.

Free World production increased steadily from February through July of this year. The downturn began in August. In that month and in September, the lower Free World total was due mainly to falling production outside the United States, particularly in the Middle East which had been responsible for much of the first-half increases.

The drop in Free World production in October brought the total for that month below the 11,828,100 bbl. daily average for the first 10 months of the year. Non-Communist foreign production for the first 10 months averaged 5,339,800 bbl. daily, as compared to the October average of 5,492,200 bbl. daily.

Production in the Middle East in October showed an increase of 106,600 bbl. daily, or 4.4 per cent. The average for the month of 2,523,000 bbl. daily was only slightly under the record high of 2,534,000 bbl. daily last June. Middle East production in October was nearly 348,000 bbl. daily, or 16 per cent, above October 1952.

Kuwait tops Aramco . . . Kuwait's 950,300 bbl. daily, representing a gain of 126,800 bbl. daily over the previous month, established a new all-time high for the producing countries of the Middle East. It also was a record as the greatest amount of oil ever produced by a single company. As a result of its October output, Kuwait's production for the first 10 months was slightly above that of Arabian American Oil Co., formerly the leading Middle East producing company.

Aramco's production in October showed only a relatively slight increase of about 16,000 bbl. daily. Production in Iraq was down 26,800 bbl. daily from the record 609,200 bbl. daily in September. Production in Qatar fell 7,300 bbl. daily to slightly more than 84,000 bbl. daily.

Venezuela . . . Production in Venezuela increased 76,300 bbl. daily to reach the highest level since last January. The month's output was more than 100,000 bbl. daily above the 2-year low of 1,682,100 bbl. daily to which production dropped in August.

Despite the substantial increase, Venezuela's October production was still 18,000 bbl. daily under the average for all of 1952. For the first 10 months

TREND OVER THE LAST YEAR

	W. Hemisphere less U. S.	Middle East	Total non-Communist foreign
1952—			
November	2,504.9	2,174.7	5,098.7
December	2,561.3	2,092.1	5,075.0
1953—			
January	2,472.8	2,252.3	5,152.2
February	2,407.2	2,258.4	5,096.8
March	2,412.5	2,266.1	5,104.8
April	2,448.1	2,426.8	5,306.6
May	2,423.1	2,523.7	5,391.0
June	2,459.4	2,536.0	5,450.1
July	2,487.7	2,534.0	5,471.9
August	2,443.3	2,489.0	5,387.3
September	2,485.7	2,416.4	5,345.3
October	2,516.3	2,523.0	5,492.2

CRUDE-OIL PRODUCTION
(Daily average in thousands of barrels)

Country—	Oct. 1953	Sept. 1953	Oct. 1952
W. Hemisphere:			
Argentina	79.0	78.9	68.8
Bolivia	1.8	1.6	1.3
Brazil	2.6	2.4	2.1
Canada	221.0	270.0	198.3
Chile	4.5	3.8	2.9
Colombia	109.0	108.6	100.4
Cuba	0.1	0.1	0.1
Ecuador	8.1	8.1	8.0
Mexico	200.0	200.0	210.2
Peru	42.0	41.4	44.7
Trinidad	62.4	61.3	58.3
Venezuela	1,785.8	1,709.5	1,767.6
Total	2,516.3	2,485.7	2,462.7
Europe & Africa:			
Algeria	1.7	1.5	1.6
France	7.3	7.3	6.7
Fr. Morocco	2.1	2.1	1.9
W. Germany	45.4	45.2	35.6
Italy	1.8	1.8	1.9
Netherlands	16.7	16.7	13.2
Egypt	46.0	46.0	46.2
United Kingdom	1.1	1.1	1.1
Total	122.1	121.7	108.2
Middle East:			
Bahrain	30.0	30.1	30.0
Iran	24.0	25.9	23.0
Iraq	582.4	609.2	526.0
Kuwait	950.3	823.5	755.6
Qatar	84.1	91.4	75.5
Saudi Arabia	851.7	835.9	764.9
Turkey	0.5	0.4	0.3
Total	2,523.0	2,416.4	2,175.3
Other Asia:			
British Borneo	101.5	101.3	104.6
Burma	3.4	3.4	2.5
India	6.6	6.6	6.0
Indonesia	205.0	196.0	180.0
Japan	6.0	6.1	6.0
New Guinea	4.8	4.8	4.9
Pakistan	3.5	3.3	3.7
Total	330.8	321.5	307.7
Total, non-Communist, foreign	5,492.2	5,345.3	5,053.9
United States	6,261.5	6,557.2	6,517.6
Total, Free World	11,753.7	11,902.5	11,571.5
Est. Russia and E. Europe:			
Austria	65.0	65.0	55.0
Romania	95.0	95.0	80.0
Russia	1,060.0	1,060.0	985.0
Other Communist	34.7	34.7	25.1
Total	1,254.7	1,254.7	1,145.1
World total	13,008.4	13,157.2	12,716.6

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these regions. Estimates also have been made for certain other countries, particularly in Southeast Asia, for which completely current reports are lacking. Iranian production shown is net output, not including recycled material. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

of 1953. Venezuelan production averaged 1,737,200 bbl. daily, against a 1952 average of 1,803,910 bbl. daily. Data presented by Carlos Perez de la Cova, minister-counsellor for petroleum affairs of the Venezuela Embassy in Washington, at a recent meeting of the Interstate Oil Compact Commission meeting, showed that the October production was 167,420 bbl. daily under the country's MER for that month of 1,953,282 bbl. daily. The low output last August was 268,260 bbl. daily under the August MER of 1,950,380 bbl. daily.

Elsewhere in Latin America, several other oil-producing countries showed encouraging gains. The October increase in Trinidad brought output to its highest level in many months. Production in Trinidad has been on a gradual uptrend for the last two years.

Production from the Chilean fields in Tierra del Fuego jumped sharply in October, presumably reflecting runs accumulating crude for the opening of the new refinery at Concon near Valparaiso. Indigenous Chilean crude is expected to furnish about a third of the charge for this 20,000 bbl. daily plant. Increased production also was reported in Bolivia where the government company is seeking to develop crude for refineries now running at only partial capacity. There are currently seven rigs active in exploration and development in Bolivia.

Although Petroleos Mexicanos, the Mexican Government company, has recently discontinued issuing figures on current production and other operations, industry estimates are that Mexican output is still lagging behind last year, despite some success in recent exploratory and development work. In Canada, now the third leading oil country in the Western Hemisphere after the United States and Venezuela, production in October showed a sharp seasonal decline, dropping nearly 50,000 bbl. daily from the previous month.

EUROPE

British Win Round

Rome court rejects damage suit against Anglo-Iranian

ANGLO-IRANIAN OIL CO., Ltd., has scored a minor legal victory in the fight over Iranian oil shipments.

A civil court in Rome denied claims for damages filed against Anglo-Iranian by an independent Italian company, Italpetroli, which contended it had been forced to cancel plans to import Iranian oil because of steps taken by the British company.

The court did not specify grounds on which it rejected the claim other than to say Italpetroli had no cause for action. Anglo-Iranian had warned Italpetroli and other prospective purchasers of Iranian oil that it still considered itself legal owner of any oil exported from its nationalized concession.

Anglo-Iranian itself has attacked Italian shipments of Iranian oil in lawsuits against two other importing companies, E.P.I.M. and Supor. A court in Venice last summer refused to grant an order impounding the oil, but cargoes are reported to be still in dock storage because the Italian government has not granted import permits. Anglo-Iranian's main case involving the ownership question is still pending in the courts in Rome.

Drilling Suspended

Danish exploration halted for appraisal of program

DANISH AMERICAN PROSPECTING CO., a Gulf subsidiary, has suspended its exploration program in Denmark.

Results of the work to date are now being assessed to determine whether the program will be continued. If drilling is resumed, possibly three more tests may be drilled in northern Jutland.

Dapco's activities have been gradually reduced during the past year. One of the three rigs, the Cardwell unit, was shipped to Tunisia, and one of the two seismograph parties was discontinued. More recently the second party has been disbanded and the personnel placed elsewhere. The Sullivan rig used for testing salt deposits and for structural work was stacked some time ago, and the heavy Emsco unit has now been laid down.

Although personnel has been reduced, the main staff and head drilling personnel is being retained. Equipment is being cleaned up and put in shape while over-all program is under study.

The company's latest deep test in Denmark was the Rodby well on the Island of Lolland south of Copenhagen. This test was dry at about 11,500 ft. total depth. Dapco has drilled some six deep wells in Denmark plus numerous shallower holes in an intensive exploratory program since 1947. In 1951, the three rigs logged a total of 57,365 ft. of hole and in 1952, a total of 45,694 ft. The seismograph work also has been carried out over a six-year period.

Gulf has spent a reported $10,000,000 in Denmark with negative results insofar as the development of commercial production is concerned. The two Tonder wells had core shows of oil but neither produced on test. Other drilling has located tremendous quantities of salt in domes which the Danish Government has considered attempting to exploit.

Gulf acquired the Danish concession

Talara Refinery Handles Peru's Production

Although Peru is entering an exploratory boom as a result of last year's passage of a new oil law, present production continues to come from the older fields. This is a panoramic view of the operating headquarters at Talara of International Petroleum Co., Ltd., the principal refining and producing company in Peru. Talara includes harbor facilities, office buildings, refinery installations, tank farm and living quarters. The Talara refinery has a capacity of 45,000 bbl. daily, including new facilities under construction.

covering the entire kingdom in 1938 when it bought out Dapco with the approval of the Danish Government. The original concession was granted earlier that year to F. F. Ravlin, Coral Gables, Fla. Dapco's operations were suspended in 1940 as a result of the German invasion, and resumed after the war in 1946.

Petrochem Plant Operating

A new French petrochemical plant has been placed in operation at Lavera adjacent of the refinery of Soc. Generale des Huiles de Petrole-B.P.

The plant is the property of Soc. Naphtachimie which is owned by S.G.H.P. Cie. Pechiny, and the Etablissement Kuhlmann. Obtaining raw material from the refinery, the petrochemical plant makes use of ethylene for synthesis of ethylene oxide, and propylene for the production of isopropyl alcohol. From ethylene oxide, a range of derivatives is processed, including glycols, polyglycols, glycol ethers, and ethanolamines. From isopropyl alcohol, only acetone is at present manufactured.

Grecian Drilling Under Way

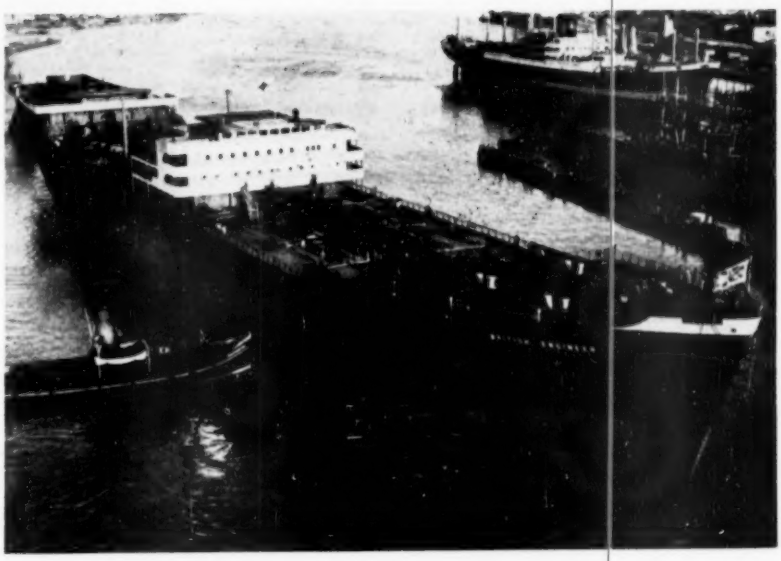
Exploratory work aimed at assessing the somewhat marginally regarded oil prospects of Greece is now under way in two different parts of the country.

In the Peloponnesus of southern Greece, William G. Helis, New Orleans independent operator, is drilling the first well in his program in the country. Helis holds a concession over the larger part of Greece.

Helis brought drilling equipment and other material into Greece last spring. K. L. M., the Dutch airline, recently reported that it had carried an entire derrick from the United States to Athens for the Helis operation.

In the northeastern part of Greece, the Greek company, Ilios, is preparing to launch an exploration program with the assistance of a West German firm. It was disclosed in Hanover that C. Deilmann Bergbau, G.m.b.H., of Bentheim had signed an agreement with Ilios to cooperate in the exploration and exploitation of the Greek company's concession in eastern Thrace. Two geologists of the German company are already carring out preliminary studies, and arrangements have been made for survey work by Seismos, G.m.b.H., of Hanover.

There are various seepages in Greece, but intermittent efforts in the past to develop production in the country have not been successful. The western part of the Peloponnesus, in the opinion of some geologists, is the most favorable part of the country. Mineral surveys, including petroleum, have been made by the Greek Government with financing from Marshall Plan funds.



Third Anglo-Iranian Tanker Launched

This 32,000-ton tanker, British Engineer, is the third of 13 similar vessels ordered for British Tanker Co., the shipping subsidiary of Anglo-Iranian Oil Co., Ltd. It was launched recently at Belfast by Mrs. Anthony Eden, wife of the British foreign secretary.

French Test Started

Esso Francaise drilling second exploratory well

ESSO FRANCAISE, S. A., has commenced a second well in the exploratory program on its concession in southwestern France.

The test, Parentis 1, situated near a village of the same name, is about 13 miles southwest of the first well, Mano 1 and is in the southwestern corner of the concession near the coast. The Parentis well, testing a feature located by seismograph, is now below 4,000 ft.

The Mano well, about 50 miles south of Bordeaux, was taken to slightly below 9,000 ft. and was suspended at the limit of the equipment. The French contracting company, Forex, is handling the drilling.

Esso Francaise, in which Standard Oil Co. (N.J.) holds 55 per cent of the stock, is the only foreign-controlling company participating in the intensive exploration now being carried out in metropolitan France. Its permit area granted in February 1951 covers an area of 4,200,000 acres. Elsewhere in France, exploratory work is being conducted by French companies partially or wholly owned by the government.

In Lacq field, northwest of Pau and about 80 miles south-southeast of the site of the second Esso well, Soc. Nationale des Petroles Aquitaine is continuing its efforts to develop deep production below the existing 2,100-2,400 ft. Cretaceous producing formations. A second deep test was taken to about 13,400 ft. at which depth 14,150,000 cu. ft. of gas daily was tested.

Gas produced in an earlier deep test had an H_2S content of 18-20 per cent, and the company has been investigating the possibility of a sulfur recovery plant. Two other deep tests are now drilling, one about a kilometer southeast and the other about a kilometer northeast of the first deep well.

ASIA

Partnership Formed

Stanvac, Indian government to share cost of drilling

STANDARD VACUUM OIL CO. has reached agreement with the Indian Government on terms under which the company will carry out further exploration for oil in the Bengal basin.

Initial reports from New Delhi indicated the company will be an operating partner with the Indian Government. A quarter of the money required for the exploration, up to 25,000,000 rupees ($5,250,000), will be provided by the government.

Most governments negotiating oil

concessions are willing to offer exploratory rights, but few are ready to advance any cash of their own in the uncertain exploratory stage. This feature sets the Stanvac-Indian agreement apart from the normal concession arrangement. The extent of the Indian Government's interest as a result of its contribution was not spelled out. It was reported the terms for the exploitation, or production, stage will be negotiated if commercial oil is found.

Standard-Vacuum, a major marketer in India, had an aerial magnetometer survey run over 73,000 sq. miles of the Bengal basin in 1951-52. Various features were found which were considered worthy of more detailed exploration, and negotiations with the government followed.

AFRICA

Licenses Granted

Libyan exploration planned by six international firms

SIX international companies—Standard Oil Co. (S.J.), Socony-Vacuum Oil Co., Inc.; Royal Dutch-Shell, Anglo-Iranian Oil Co., Ltd.; Conorado Petroleum Corp.; and American Overseas Petroleum, Ltd. (Caltex)—are preparing to undertake preliminary exploratory work in Libya in north Africa.

One-year exploratory licenses are being granted as a result of the recent passage of a mineral resources law by the parliament of the new country. Under this legislation, the licenses are granted by authorities of the three states, Tripolitana, Cyrenaica, and Fezzan, with the approval of the central government. Libyan officials have decided to restrict issuances of the licenses to experienced and qualified companies and exclude individuals who may apply.

Libya is a former Italian colony with a total area of about 1,100 square miles. After the war, the French took over the administration of Fezzan and the British in Cyrenaica and Tripolitana. The country became an independent state about two years ago under United Nations auspices.

The French Government recently began discussions with Libya on a treaty covering French interests in Fezzan. Britain has already signed a treaty of friendship and alliance with Libya giving it the right to station troops in the country in exchange for an annual grant of £4,000,000 ($11,200,000), and the United States Government is reported to be negotiating to lease air bases in Cyrenaica and Tripolitania.

Some time ago before the passage of the mineral resources law, the French oil company, Omnium Francais de Petroles, S. A., made application for exploratory rights in Fezzan. Omnium Francais has large interests in principally marketing operations in western Europe, North Africa, and the Eastern Mediterranean. Other French companies are actively exploring a large area across the Libyan border from Fezzan in central and southern Algeria.

The exploration authorized under the licenses given the six large companies is non-exclusive and not binding on the government. Further activities beyond these investigations depend on the passage of a satisfactory petroleum law by the Libyan Parliament. The government is now reported to be working on such legislation with a view of having it completed and in effect before the 1-year exploratory licenses expire next fall. Under the circumstances, the companies involved are expected to confine their work at this stage to preliminary geological reconnaissance.

Submarine Lines Planned

Equipment and personnel for laying submarine pipe lines for two projects in West Africa and India are being provided by Collins Construction Co., Port Lavaca, Tex.

At Accra on the Gold Coast of West Africa, 11,500 ft. of 12⅝-in. gunnited pipe will be launched for Socony-Vacuum (West Africa), Inc. The launchway to be used was employed laying the dual 4-mile underwater crossing of the Straits of Mackinac in northern Michigan in September.

At Bombay, India, three crude lines, three for products, and one water line will be laid in the Bay of Bombay from Butcher Island to Trombay Island. These lines are being built by the Bombay Port Trust for use of the refineries now being built on Trombay Island by Standard-Vacuum Oil Co. and Burmah-Shell. The deep-water docking facilities are situated on Butcher Island.

LATIN AMERICA

Creole Changes Prices

Price adjustments affecting two of the 15 Venezuelan crudes for which Creole Petroleum Corp. posts prices have been announced in a new bulletin by the company.

The flat price for Lagunillas heavy crude f.o.b. Amuay Bay or Las Piedras was cut 20 cents to $1.85. Pedernales crude of 20°-20.9° gravity was increased 24 cents to $1.61. The changes were effective January 1.

AUSTRALIA

Dedication Slated

Shell nearing completion of refinery near Melbourne

THE new Shell refinery at Geelong, Australia, the first of four new refinery projects in Australia to be completed, is scheduled to be formally opened March 18.

The 25,000-bbl. daily plant is now nearing completion on a 250-acre site near Melbourne. The Geelong project has cost the equivalent of between $20,000,000 and $22,000,000. The main process unit is the distillation plant which was built by Werkspoor, Ltd., in the Netherlands.

The Shell Co. of Australia, Ltd., has announced that Field Marshal Sir William Slim, governor-general of Australia, has accepted an invitation to open the new refinery formally on the dedication date.

Crude for the refinery will be supplied from Shell's Seria field in Brunei, North Borneo, where production of more than 100,000 bbl. daily has been developed since the end of the war. The Geelong refinery project includes a 36-mile, 8-in. products line which will have a capacity to deliver about 20,000 bbl. daily of products into the Melbourne metropolitan area. Other facilities include a half-mile-long tanker jetty constructed by the Geelong Harbour Trust Commissioners to accommodate the 18,000-ton general-purpose Shell tankers.

Other projects . . . The other three refinery projects under way in Australia are the Kwinana plant of Anglo-Iranian Oil Co., Ltd., to be completed in mid-1955; the refinery being built at Altona near Melbourne by Standard-Vacuum Refining Co.; and the refinery of Australian Refining, Ltd. (Caltex) at Kurnell near Sydney to be finished by the end of 1955. The 22,000-bbl. daily Stanvac refinery at Altona, where the company now has an 1,800-bbl. daily refinery primarily for the production of lubricating oil, is scheduled to begin operations next October. These four projects will raise Australian refining capacity from approximately 20,000 bbl. daily to around 160,000 bbl. daily.

Now at Jersey Helm

Refinery engineer succeeds Holman as top executive

THE man who now heads the world's largest oil company once served as a labor representative in employe-management negotiations during his early career at the Baton Rouge, La., refinery of Standard Oil Co.

Monroe Jackson Rathbone, known to his associates as Jack, has come a long way since those days as a design and drafting engineer. He became president of Standard Oil Co. (N. J.) last week succeeding Eugene Holman, now chairman of the board.

Rathbone was born in 1900 at Parkersburg, W. Va., where his father worked at the old Standard Oil refinery for more than 20 years. His education at Lehigh University was interrupted by service as an infantry lieutenant in World War I, but after the war he completed his course in chemical engineering and went to work immediately at the Baton Rouge refinery.

Rathbone's rise in the refinery organization was rapid. He moved from design and drafting engineer to construction engineer, assistant to the general superintendent, general superintendent of the Baton Rouge plant and then to assistant general manager of manufacturing, vice president and general manager, and finally president of Standard Oil Co. of Louisiana.

He was elected president of Esso Standard Oil Co. in 1944 and in 5 years as president of the principal Jersey domestic refining and marketing company, he directed the largest modernization and expansion program of the company's history.

While at Baton Rouge, Rathbone saw that refinery grow from a simple plant to one of the largest integrated refining and petrochemical operations in the industry. Baton Rouge produced the first commercial synthetic rubber in this country, operated the first fluid catalytic cracking unit, and became the first large producer of aviation-gasoline blending stock.

With this sort of background, it is not too strange that Rathbone's forte is domestic refining and marketing. He has participated in the work of various industry and government committees, particularly those dealing with questions of supply and product prices. Since he now heads the parent company with widespread foreign interests, he'll probably be setting off soon on an extensive foreign trip to the company's affiliates abroad.

Rathbone lives in Summit, N. J., where he finds some time for golf. He has a camp, partially built by himself, on the Amite River near Baton Rouge for duck hunting.

The Rathbone name has been associated with the oil industry for two generations now. If it continues, the third generation will be skipped. His son, Monroe Jackson III, is a resident physician at a New Orleans hospital, but one of his five grandchildren is Monroe Jackson IV.

Alexis Voorhies, Jr., director of the Esso Laboratories at Baton Rouge, La., has been selected to receive the Louisiana Engineering Society's technological achievement award for 1953. The award is made annually to an engineer in the state for distinguished technological advancements or discoveries that contribute to engineering. Voorhies joined the Esso Laboratories in 1930, and was named director in 1947.

Sidney M. Blair of Toronto has been elected president of Canadian Bechtel, Ltd., an affiliate of Bechtel Corp. He has been vice president and a director of Canadian Bechtel and with that firm in Toronto since 1949. From 1927 until 1949 he was associated with Trinidad Leaseholds, Ltd., in Trinidad, London, and Canada, completing his service with this oil company as controller of research and development.

K. W. Martin has been named manager of the transportation and supplies department of Shell Oil Co., moving up from assistant manager of that department.

Paul B. Ware, formerly with Pacific Western Oil Corp. as a petroleum engineer, has joined The Texas Co. as an engineering trainee at Long Beach, Calif.

M. I. Kirsch, Jr., drilling supervisor and geologist for Continental Oil Co., has been transferred from Coldwater, Kans., to Harper, Kans.

G. L. Brennan, manager of the liquefied petroleum gas division of Warren Petroleum Corp. for the past 12 years,

G. L. BRENNAN

H. E. FELT

has been elected vice president in charge of the firm's L.P.G. division. He succeeds **Howard E. Felt,** who resigned January 1 as a step toward his retirement March 1, the twenty-fifth anniversary of the date he joined the firm. Felt will remain a director and active in the management of the division until his retirement and then will be available for consultation and special assignment. He had been a vice president since 1941. Brennan joined Warren in 1941 as manager of the L.P.G. division. **Fred S. Schwend,** assistant manager supplies, has been promoted to manager of the division, and **K. T. White,** for several years head of the division district office in Houston, has been made sales manager of the division in Tulsa.

Philip E. Beckman has been appointed vice president in charge of gas operations by Pacific Gas & Electric Co., San Francisco. His appointment to the newly created position is to effect a reorganization of the gas department upon the retirement December 31 of **Raymond S. Fuller,** manager of gas operations, and **Frederick V. Doyle,** general superintendent of gas supply and control. **W. G. B. Euler,** executive vice president and former vice president and general manager, also will retire December 31. Beckman joined Pa-

cific in 1921 and has been general superintendent of technical services in the gas department since 1950.

Dr. Frank H. Dickey, formerly chemistry instructor at the University of California, Berkeley, has joined Continental Oil Co. as a consultant in theoretical research, with headquarters in Ponca City, Okla.

Paul S. Hopson has returned to Bismarck, N. D., as district geologist for Gulf Oil Corp. after spending 6 months at Gulf's geophysical and geological school in Pittsburgh. **Howard Lorenz,** acting district geologist, has returned to Billings, Mont.

William A. Greenwalt, Jr., formerly division geologist for Union Oil Co. of California at Santa Maria, Calif., has been transferred to a similar position in Peru. **Layton W. Stanton,** division geologist in the Sacramento area, has succeeded Greenwalt at Santa Maria.

Jarvis Garst has resigned as division geologist in Jackson, Miss., for Honolulu Oil Corp. to join Housh Drilling Co. and other Housh enterprises as a geologist. Prior to joining Honolulu 5 years ago, he had been associated with Union Oil Co. as district geologist in Houston and Jackson, with Plymouth Oil Co. as district geologist in South Texas, and with Continental Oil Co. for several years in Mexico.

Jorge Morales Vega has joined Compania Petrolera Lobitos as a production engineer at Lobitos, Peru.

T. W. G. Thomson, manager of Texaco Exploration Co. since March 1, 1952, has been appointed vice president and manager of the company. He also is a vice president of The Texas Co., of which Texaco Exploration is a wholly owned subsidiary. Thomson, with the firm since January 1, 1951, was named acting manager on August 1, 1951, and manager on March 1, 1952.

Midwest Research Institute Names New Officers

Harry Moreland, (left), Kansas City, Mo., president of Great Lakes Pipeline Co., is shown after his recent election as chairman of the board of governors of Midwest Research Institute, with Kenneth A. Spencer, (center), president of Spencer Chemical Co., who was elected chairman of trustees, and Dr. Charles N. Kimball, president of the institute.

Ed L. Shannon, Jr., petroleum engineer formerly with Union Oil Co. of California at Santa Paula, has joined Santa Fe Drilling Co. at Santa Fe Springs, Calif.

H. W. Jones, manager of industrial relations of Atlantic Refining Co., has been elected a vice president of the company. He joined Atlantic in 1926 as a chemical engineer and was named manager of industrial relations in 1935.

J. Ed Warren, who joined the National City Bank of New York in November as a petroleum consultant, has been appointed a vice president. Warren formerly was deputy administrator of the Petroleum Administration for Defense. He is a past president of the Independent Petroleum Association of America and of the American Association of Oil Well Drilling Contractors.

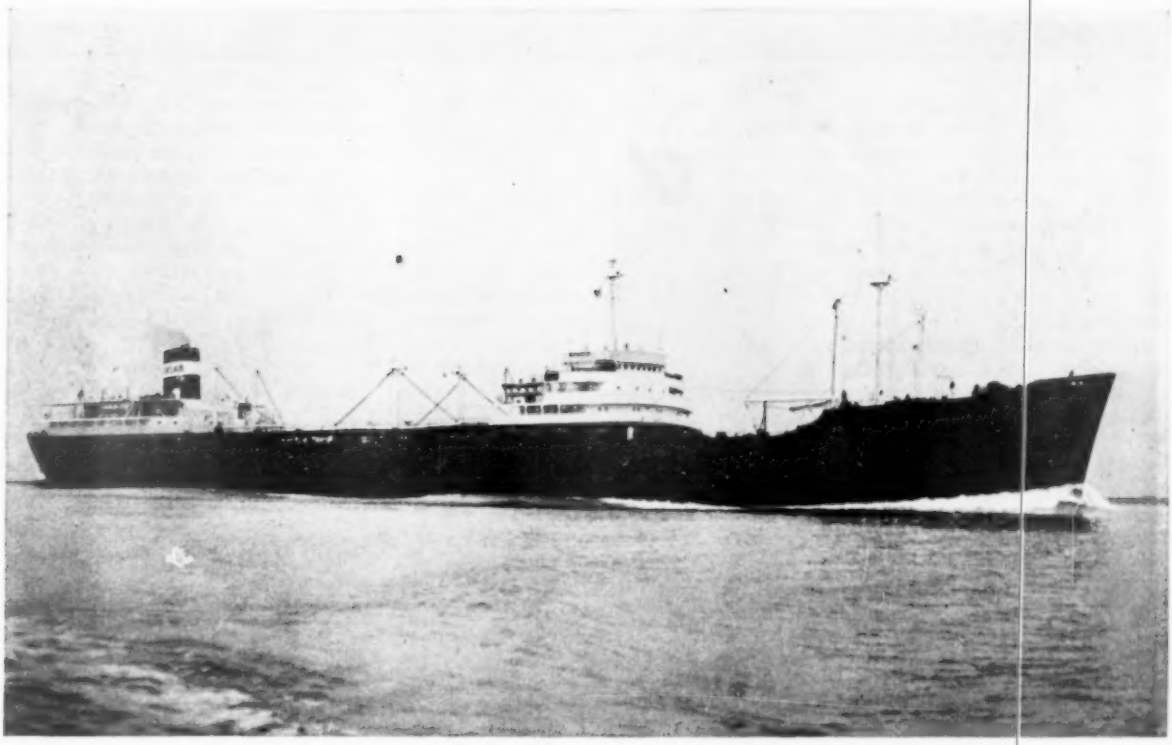
Charles S. Jones, president of Richfield Oil Corp., has been elected president of the Western Oil and Gas Association, succeeding **L. L. Aubert,** president of Bankline Oil Co. Jones served as president of the association, then known as the California Oil and Gas Association, in 1934 and 1935. **John W. Hancock,** president of Hancock Oil Co., was elected first vice president; **Lowell Stanley,** chairman of the board of Monterey Oil Co., second vice president; and **William Reinhardt,** vice president of Union Pacific Railroad Co., reelected treasurer. **Felix Chappellet** was named secretary and acting general manager. Thirty incumbent board members were reelected and **B. E. Devere,** president of Pathfinder Petroleum Co., and **R. R. Von Hagen,** president of Lloyd Corp., Ltd., were named to the board.

F. P. Hurry, formerly geologist in the secondary-recovery section of Carter Oil Co. in Tulsa, has been made office geologist in the firm's stratigraphic section in Shreveport, La.

Howard W. Page, since 1949 representative of Standard Oil Co. (N. J.) in the United Kingdom, and **Peter T. Lamont,** coordinator of marketing activities for the company, have been elected to Jersey Standard board of directors. Their election brings membership of the board to 14.

T. G. Caley, Basin Oil Co., Saginaw, Mich., has been reelected president of the Oil and Gas Association of Michigan. Other officers reelected are: **J. Walter Leonard,** Leonard Oil, Inc., Mount Pleasant, vice president; **William Palmer,** Lansing, secretary; **E. Allan Morrow,** Roosevelt Oil & Refining Corp., Mount Pleasant, and **Kurt deCousser,** Socony-Vacuum Oil Co., Inc., Lansing, cotreasurers.

Stanley G. Britton has been promoted by Pure Oil Co. from production engineer at Midland, Tex., to assistant chief division production engineer at Fort Worth. He has been replaced at Midland by **Darell L. Proctor,** who had been in Fort Worth. **James C. Black** has been transferred by Pure from the development section in Fort Worth to become district geologist at Shreveport, La., replacing **William J. Nugent,** who has resigned. Other changes in the firm's geological de-



Sinclair Refining Company's P. C. SPENCER on her delivery trials out of Bethlehem's Sparrows Point Shipyard.

New Middleweight Champion

The "little supertanker" P. C. SPENCER, recently built for Sinclair Refining Company, is Bethlehem's answer to the quest for an "all-purpose" tanker—big enough and fast enough for transocean service, but small enough for most existing port facilities. The 25,000-ton P. C. SPENCER can go almost anywhere the 16,500-ton T-2 can . . . 10 to 20 per cent faster, with 50 per cent more cargo, with no additional cargo discharge time, with greater economy, with greater dependability.

Truly, she's a fitting addition to the long line of distinguished ships bearing the label, "Bethlehem-Built."

Main Particulars, P. C. SPENCER

Length overall	604′ 7½″
Length between perpendiculars	575′ 0″
Beam molded	78′ 0″
Depth molded	44′ 2¾″
Deadweight at assigned draft	25,200 tons
Draft to assigned water line (summer)	33′ 8″
Cargo tank capacity	212,425 bbls
Main cargo pumps capacity	15,000 bbls/hr
Shaft horsepower (maximum continuous	13,750
Speed	17½ knots

SHIP REPAIR YARDS

Boston Harbor — New York Harbor
Baltimore Harbor — Beaumont, Texas
Los Angeles Harbor — San Francisco Harbor

SHIPBUILDING YARDS

Quincy, Mass. — Staten Island, N. Y.
Sparrows Point, Md. — Beaumont, Texas
Terminal Island, Calif. — San Francisco, Calif.

BETHLEHEM STEEL
Shipbuilding Division
GENERAL OFFICES: 25 BROADWAY, NEW YORK 4, N. Y.

On the Pacific Coast shipbuilding and ship repairing are performed by the Shipbuilding Division of Bethlehem Pacific Coast Steel Corporation

PERSONALS

partment include: **Donald R. Raney,** from Shreveport to the development section in Fort Worth; **Robert Davis,** Shreveport to Wichita Falls, Tex.; **Robert Glaze,** from Wichita Falls to Midland; **Miller Goodger,** assigned to the office at Roswell, N. M.; and **James I. Johnson,** from Fort Worth to Shreveport.

Robert A. Kent, formerly exploitation engineer with Shell Oil Co. at Bakersfield, Calif., has been transferred to Ventura as a mechanical engineer.

William Vrana has been promoted from senior geologist for Tennessee Production Co. at Houston to district geologist at Corpus Christi, Tex.

Fred J. Kelly, production superintendent for Texas Consolidated Oils, has been transferred from Oxnard, Calif., to Dallas.

Ross Floyd, Ponca City, director of agricultural services for Continental Oil Co., has been appointed chairman of the American Petroleum Institute's committee on agriculture for 1954. He succeeds **M. C. (Mike) Enright,** Gulf Oil Corp., Pittsburgh, who has been chairman for the past 2 years. Vice chairmen appointed are: **Mark Butterworth,** General Petroleum Corp., Los Angeles; **N. B. Curtice,** Pure Oil Co., Minneapolis-St. Paul, Minn.; and **Dr. K. G. Mackenzie,** New York.

Al McGregor, geologist formerly with The Texas Co., has joined Ryan Oil Co. and Davis Oil Co. in Denver.

M. M. Fidlar has been advanced by Mountain Fuel Supply Co. from manager of exploration to the newly created position of vice president in charge of exploration. He was assistant state geologist and state gas supervisor for the Indiana State Department of Conservation from 1936 to 1938, and was Indiana district geologist for Ohio Oil Co. until he joined Mountain Fuel in 1943 as senior geologist. Fidlar was made chief geologist in 1945 and named manager of exploration in 1951.

Laurie M. Sloan has been promoted by Humble Oil & Refining Co. from district petroleum engineer at Friendswood, Tex., in the Gulf Coast division to senior petroleum engineer in the petroleum-engineering division of the Houston office.

W. D. C. McKenzie, with Imperial Oil, Ltd., in Calgary, Alta., has been elected chairman of the board of governors of the Canadian Petroleum Association, succeeding **C. U. Daniels,** president of Royalite Oil, Ltd., Calgary. Other officers named are: **Charles Hay,** president of Hi-Way Refineries, Ltd., Regina, Sask., first vice president; and **E. D. Loughey,** Canadian Gulf Co., Calgary, second vice president.

Charles H. Rice, chemical engineer, has resigned his position with Standard Oil Co. (Ind.) in Whiting, Ind., to join Callery Chemical Co. in Callery, Pa.

Darrell Boyd, geologist with Pure Oil Co., has been transferred from Dickinson, Mont., to the geophysical department in Billings, Mont. He has been replaced by **Robert H. Dickey.**

Robert P. Bernhard, formerly field engineer for The Texas Co. at Freer, Tex., has been transferred to Alice, Tex., as reservoir engineer.

Robert A. Fair, petroleum engineer with Ashland Oil & Refining Co., has been transferred from Pauls Valley, Okla., to Billings, Mont.

M. F. Wirges, Cities Service Oil Co., has been elected chairman of the Oklahoma section of the American Institute of Chemical Engineers. Other new officers include: **J. W. Davison,** vice chairman; **J. J. Moon,** secretary; **Glen Herbolsheimer,** treasurer; and **R. G. Atkinson** and **C. C. Chapman,** executive committee members. All are with Phillips Petroleum Co.

Geologists Name New Steering Committee

W. R. Canada, Magnolia Petroleum Co., Houston, extreme right, has been elected chairman of the 1954 steering committee of the Gulf Coast Association of Geological Societies. The organization is composed of 11 societies dedicated to the publication and annual presentation of technical papers relating to problems of primary interest to Gulf Coast geology. Others shown are, left to right: D. D. Utterback, Freeport Sulphur Co., New Orleans, past vice chairman; Keegan Carter, Gulf Refining Co., Shreveport, La., past treasurer; Will H. Knight, Union Producing Co., Jackson, Miss., vice chairman; R. T. Wade, Schlumberger Well Surveying Co., Shreveport, past chairman; J. S. Spencer, General Geophysical Co., Houston, past secretary; and W. A. Petersen, Continental Oil Co., Corpus Christi, Tex., secretary. E. W. Kimball, Continental Oil Co., Houston, treasurer, is not pictured.

PERSONALS

Elbert F. Davis, petroleum-engineer trainee with Continental Oil Co., has been transferred from Lance Creek, Wyo., to Ponca City, Okla.

Herbert Bernard Hegglund has been advanced by Creole Petroleum Corp. from acting to assistant division manager at Maracaibo, Venezuela.

S. R. Berthiaume and **J. H. Rambin, Jr.,** have been promoted by The Texas Co. to assistant general managers of

BERTHIAUME

RAMBIN

the producing department, with headquarters in the general manager's offices in Houston. **G. T. Briggs,** assistant manager of the Louisiana division's producing department, will succeed Rambin as division manager. Berthiaume for the past year has been assistant to the general manager of the producing department. Rambin started with the company in 1934, and was made manager of the Louisiana division in 1951.

F. W. J. (Billy) Hass has retired after almost 40 years with Shell Oil Co. He opened the first Houston office for Shell in 1922. Hass has been in charge of drafting for Shell's technical service division for several years.

H. H. Hindry has been promoted by Shell Oil Co. from division mechanical engineer at Ventura to production superintendent in the Bakersfield division. **V. S. Clay,** formerly area drilling engineer in the Los Angeles headquarters, has replaced Hindry at Ventura. **J. W. Speer,** formerly mechanical engineer at Ventura, has taken over Clay's former duties. Other recent promotions and transfers in the area production department include: **R. J. Jewett,** development engineer, transferred from Bakersfield to Ventura; **W. K. Ghauri,** promoted from junior to development engineer at Ventura; **R. A. Kent,** from Bakersfield to Ventura as mechanical engineer; **B. N. Shepard,** moved from Long Beach to Salt Lake City as development engineer; **I. A. Wyant, Jr.,** promoted to development engineer and moved from Los Angeles to Glendive, Mont.; and **D. S. Collins,** formerly geologist in the Bakersfield division offices, moved to the Los Angeles area offices as a development engineer.

Samuel Messer, Oil City, Pa., has been elected chairman of the board of Quaker State Oil Refining Corp. He succeeds Harry J. Crawford, who died November 3. Messer has been with the company for more than 50 years, serving as vice president, president, and vice chairman of the board.

Castle J. C. Harvey has resigned as exploration manager of Deep Rock Oil Corp.'s southern region to become supervisor of geophysical operations for Texas Pacific Coal & Oil Co. in Fort Worth. He also will coordinate geophysical and geological activities. His resignation was effective December 31, and he will assume his new duties shortly. Harvey joined Deep Rock 3 years ago as manager of the geophysical department and was made regional exploration manager last June.

John I. Bush, geologist for Carter Oil Co., has been transferred from Wichita, Kans., to Oklahoma City.

H. S. Rahme has joined Stanolind Oil & Gas Co. as a research petroleum engineer in Tulsa.

Roy H. Junkins, formerly field engineer at Madison, Kans., has been transferred by Cities Service Oil Co. to Great Bend, Kans., as corrosion engineer.

Wallace H. Collins has retired as general superintendent of production for Shell Oil Co. He joined Shell in 1927 in Tulsa and in 1936 was appointed production manager of the North Texas division. Collins had been general superintendent since 1948.

James R. Gahan retired December 31 as assistant vice president of Tide Water Associated Oil Co. He joined Tide Water in 1920 and has been in Houston since 1933. Gahan is a director and member of the executive committee of the Texas Mid-Continent Oil and Gas Association.

DEATHS

Kenneth Meyer, 55, died recently at his home in Bradford, Pa., following an illness of several weeks. He was vice president, general manager, and a member of the board of directors of Case-Pomeroy Oil Corp. and a director of Core Laboratories, Inc., Dallas, and Houghton Laboratories, Inc., Olean, N. Y.

Walter J.. Salmon, 80, died December 26 in New York City after a 2-year illness. He was president of Salmon, Lafayette, and Bonaventure Oil companies, all formed in Tulsa by him about 2 years ago. His first oil activity was with Deep Rock Oil Corp. in developing a secondary recovery project in the Bush City shoestring pool in Anderson County, eastern Kansas.

Howard A. Watson, 39, field superintendent in Sun Oil Co.'s Gulf Coast division, died recently in Beaumont, Tex.

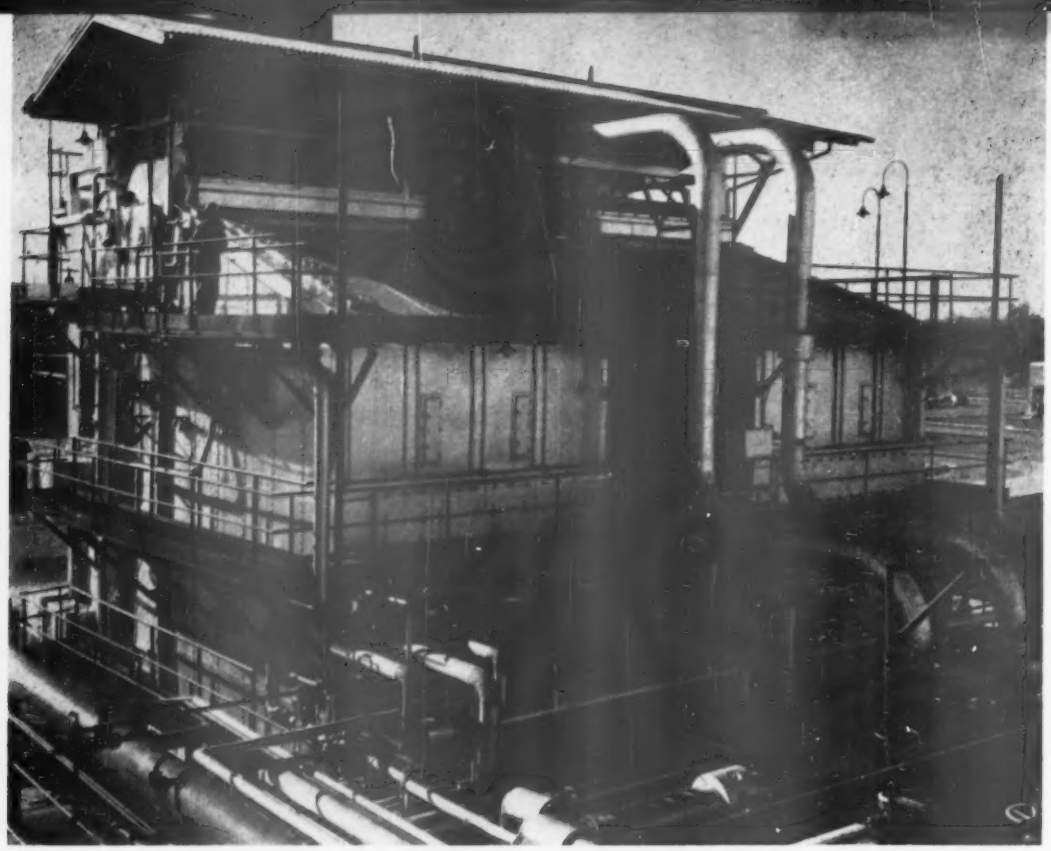
Michael E. McKeever, 86, pioneer drilling contractor, died December 25 at his home near Tulsa, following a long illness. He came to Tulsa from Sugar Creek, Pa., in 1903 as general superintendent of Guffey & Galey Oil Co., but became an independent contractor after the firm was merged with Barnsdall Oil Co.

Eben W. Pyle, Kansas producer, died December 25 in Kansas City following a heart attack. His home was in Wichita.

Reginald Houghton Burdick, 69, died recently in Birmingham, Ala., after a brief illness. He was consulting engineer of Southern Natural Gas Corp. and retired chief engineer and vice president of the firm.

Matthew D. Mann, Jr., 69, died recently in Roselle, N. J. He was the first operational director of Esso Standard Oil Co.'s refinery at Bayway, N. J., and was credited with development of continuous and commercial-scale production of isopropyl alcohol and white oil. Mann also was instrumental in perfecting the application of the bubble-cap principle of petroleum fractionation.

John F. Walker, 65, independent operator, died recently in Weimar, Tex.



Conoco leaves boilers outdoors at Billings . . Learns that

Unhoused Boiler Installations Are Cheaper, Safer

. . . and experiences no trouble, even in subzero weather

by K. S. Andrea

THE boiler installation at the Billings refinery of Continental Oil Co. is completely unhoused. Little or no trouble is experienced with boiler operation, even during the winter months when subzero weather is quite common. Advantages of the unhoused installation include:

- Safer operation—the two operators are housed in a separate control room.
- Lower initial investment and maintenance costs.

Type of boilers used . . . Steam is provided for the refinery by two boilers, each capable of producing 90,000 lb. per hour. The steam is produced at a pressure of 600 psi. and 700° F. temperature. These boilers are located outside with no protection from freezing weather other than a minimum amount of steam tracing. High-temperature steam is required to trace lines used in transferring 180° F. melting-point asphalt. The 25,000-cu. ft. per minute blower which provides air for the catalytic cracking unit is driven by a steam turbine. The size and cost of the turbine were held to a minimum by using high-pressure steam and total condensing exhaust.

Author is assistant superintendent, Billings refinery, Continental Oil Co.

Safety is of primary importance in any plant. The outside boilers are operated by two men per shift in a separate control room, thus the operators are not jeopardized in case of burner backfiring, fuel-supply leaks, or boiler explosion.

Low initial investment and maintenance on a building are major contributing factors. Housed boilers would increase investment cost about $25,000 for the most inexpensive type of material.

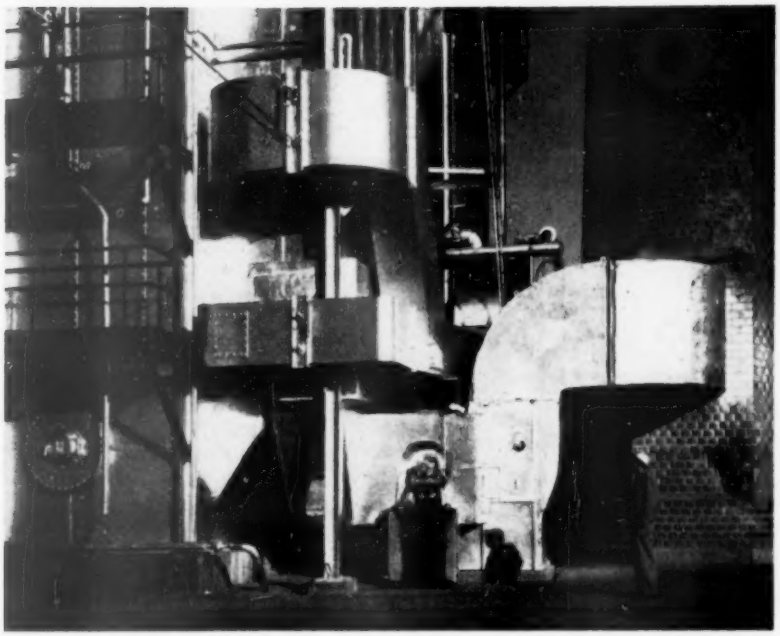
Weather protection . . . Steam tracing and insulation protect sludge blowdown lines and valves. Sample lines, pressure-gage lines, chemical injection lines, and feed-water lines are also protected by steam tracing.

Dibutyl phthalate, a chemical of low pour point which is immiscible with water, is used as a seal on pots and flow-meter lines.

Boiler fuel . . . The main source of fuel for the boilers is refinery gas composed of methane and ethane. The refinery also extracts 400,000 cu. ft. per day of hydrogen sulfide by means of a Girbotol unit. The hydrogen sulfide extracted from gas and liquid hydrocarbons is burned in the boilers.

Moreover, heavy fuel oil running 4° A.P.I. gravity is also burned in the boilers. The amount of fuel oil burned varies with the availability of gas and the price of fuel oil. Each boiler is fired with four combination burners. Each burner can use gas and fuel oil at the same time since the outside burner ring handles gas or a mixture of gas and hydrogen sulfide while an inside lance provides fuel oil to the burner tip.

The boilers are automatically operated. Four different steam pressures are



INDUCED-DRAFT FAN on one of Continental's boilers at the Billings refinery. Induced fan speed is controlled by the pressure in the fire box, which is held constant at 0.2 in. of water vacuum.

used in the refinery. These are 600, 175, 40, and 20 psi. A number of turbines are driven with 600-psi. steam and exhaust to the 175-psi. system. The remainder of the turbines require 175-psi. steam and exhaust either to the 40-psi. or 20-psi. steam systems. The control board, feed-water pumps, and part of the water-treating equipment are located in a building near the boilers.

Draft for the boilers is provided by both induced and forced-draft fans. A 120-ft. stack provides additional draft. This stack is constructed of brick to eliminate corrosion resulting from the flue gas after it reaches the dew point.

Induced fan speed is controlled by the pressure in the firebox. The firebox is held firmly constant at 0.2 in. of water vacuum.

Forced fan speed is controlled by both the steam load and the differential pressure of the flue gas across the preheater.

The boiler controls are located outside between the boilers. Oil was first used on the dash pots but trouble was experienced on cold days because the oil became too heavy for efficient operation. A change was made to D.C. 200 silicone fluid which has a very high viscosity index and the dash-pot operation is now satisfactory.

Although cold winds will affect the operation of the expansion tube on the feed-water regulator, a small partition constructed on one side of the level controllers has reduced any variation in operation due to winds.

The load required from each boiler is regulated by automatic rating controllers.

Air preheater operation . . . During the first winter's operation of the boilers, difficulty was experienced with plugged or corroded economizer (air preheater) tubes. Some of the tubes became completely plugged. This condition was caused by the use of hydrogen sulfide as fuel.

Aluminum tubes were installed in one boiler but the plugging trouble was not solved. The solution was found by changing the flow of cold air and flue gas to concurrent instead of counter current. Dampers were installed in the ducts and a bypass duct of cold air around the economizer was provided so that the flue gas effluent from the economizer could be held at any desired temperature.

By controlling the temperature of the flue gas to the stack above 400° F. iron sulfide deposits were eliminated. This cold-air bypass is used only in winter operation and the amount of cold air taken through the bypass will depend on atmospheric temperatures.

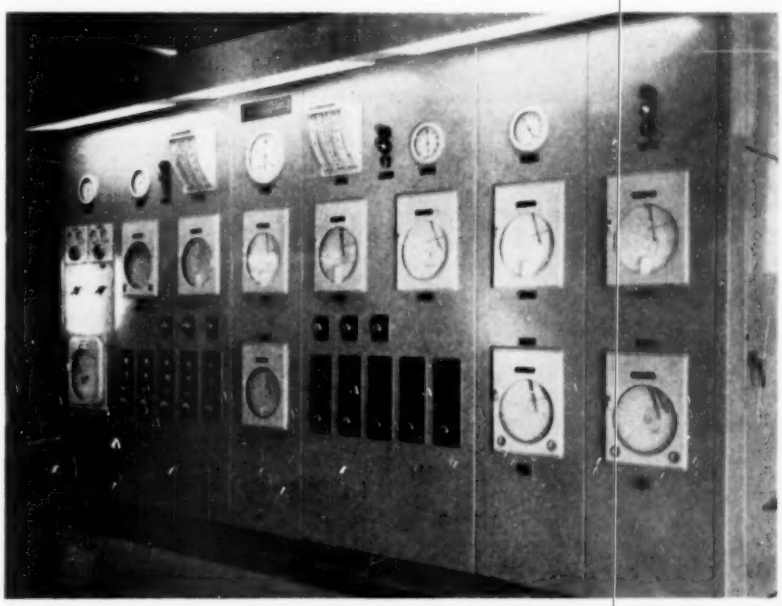
Thermocouples and dial thermometers are used to determine air and flue-gas temperatures.

Each economizer contains 550 carbon-steel tubes. The tubes are 8 gage 2½-in. o.d. and 30 ft. long.

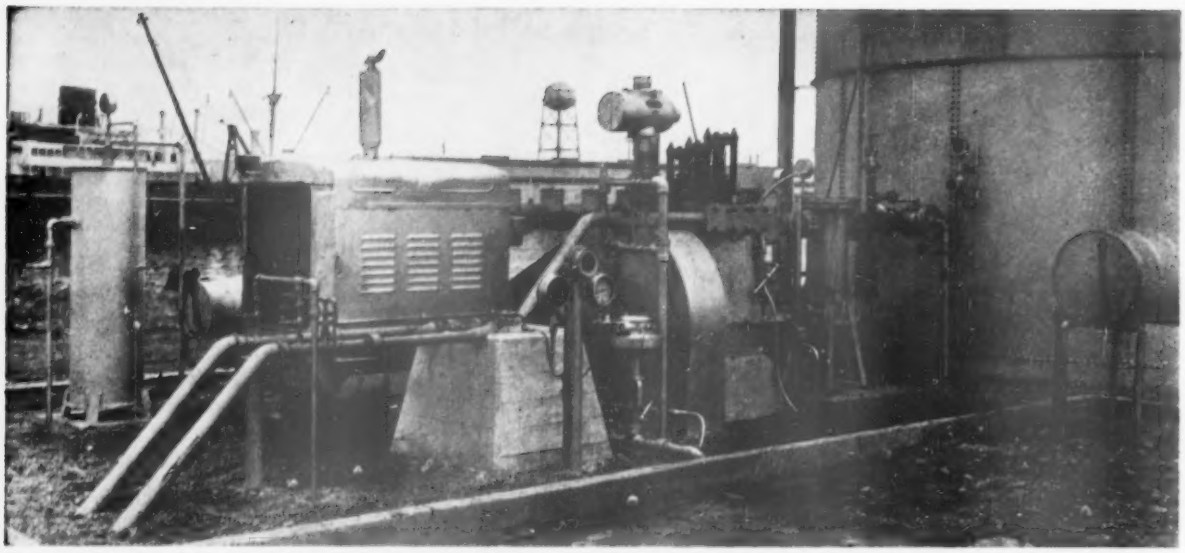
The following table shows some average readings on the economizer operation:

	Summer	Winter
Flue-gas temperature—		
Before economizer	511° F.	570° F.
After economizer	440° F.	452° F.
To stack	435° F.	447° F.
Burner air temperature—		
Before economizer, (atmospheric)	85° F.	35° F.
After economizer, (to burners)	308° F.	286° F.

Subsequent inspections of the economizer tubes following the revision of the flow of air through and around the economizer have revealed clean tubes with little or no corrosion.



BOILER CONTROL PANEL is located in separate control room, adjacent to the boilers. This provides for safer operation, since the operators are usually in the control room.



SUPPLY OF BRINE for the Block 5 trial flood is obtained from a 120-ft. well and pumped directly to the two injection wells, without storage, by the engine-driven triplex pump. The tankage provided is for emergency use.

Filtered Ocean Water Used to Flood

SURFACE FACILITIES of the two injection wells on Pier B. The wells are bottomed approximately 2,000 ft. away, one on either flank of the subpool being flooded.

Wells in California's Wilmington Field

by D. H. Stormont
West Coast District Editor

A SMALL water-injection project recently started in the Long Beach Harbor area of Wilmington field in California holds a prominence far greater than its size warrants.

Located on properties owned by the city of Long Beach and operated by Long Beach Oil Development Co., it involves only a three-well subpool. Water injection, via two input wells, has not been under way sufficiently long for its effectiveness to be determined.

But if the small flood results in increased oil recovery and proves that reservoir pressures can be maintained, large-scale projects in other Wilmington fault blocks and zones are expected to follow.

An unusual aspect is the use of ocean water. The brine is obtained from a shallow well, to take advantage of the natural filtration provided. It is filtered sea water, however, as shown by drawdown tests and analyses.

The subpool selected for the trial flood is in the upper Terminal zone in Fault Block 5-B. The zone is comprised of three main subzones, the HX, J-Y, and K-Z-W-A. Water is being injected into the upper sand of three productive members which make up the HX subzone.

The Allied A-1 fault completely traverses the productive limits of the upper HX sand on the west side (see Figs. 1 and 2). The Pier A fault, al-

though primarily crestal, serves as a boundary on the east edge. Bottom water limits the pool on both the northern and southern flanks.

The upper HX sand averages 40 ft. thick and lies at a depth of approximately 3,000 ft. The pool is about 1,000 ft. wide and contains 37 acres, or approximately 1,500 acre-ft. of productive sand. It is completely developed by three wells which are open only to the upper HX sand.

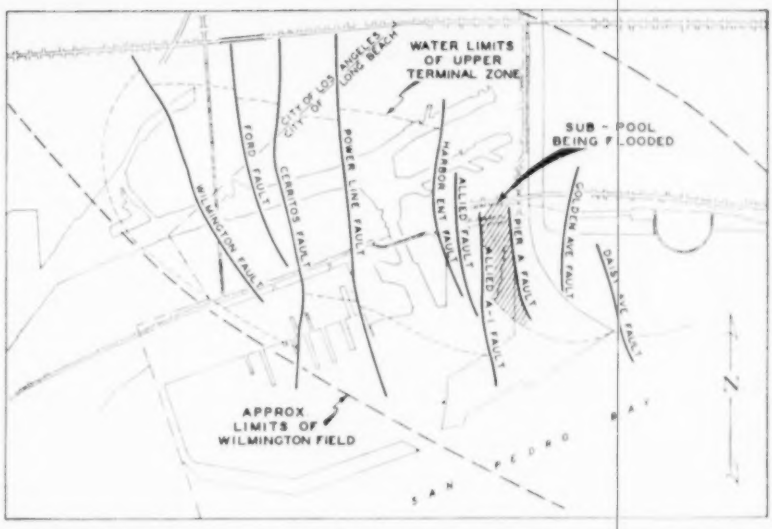
Flood-pot tests of the sand showed a residual oil saturation in the order of 20 per cent of the pore space. Existing saturation averages over 65 per cent of the pore space, it was estimated, and is probably as high as 70 per cent in the down-flank areas due to the influence of gravity segregation.

Gross recovery indicated by the tests was about 28 per cent of the pore space. This amounts to 44 per cent of the total oil in place, and 776 bbl. per acre-foot more than would be recovered by pressure depletion. Primary methods are expected to yield less than 25 per cent of the oil in place.

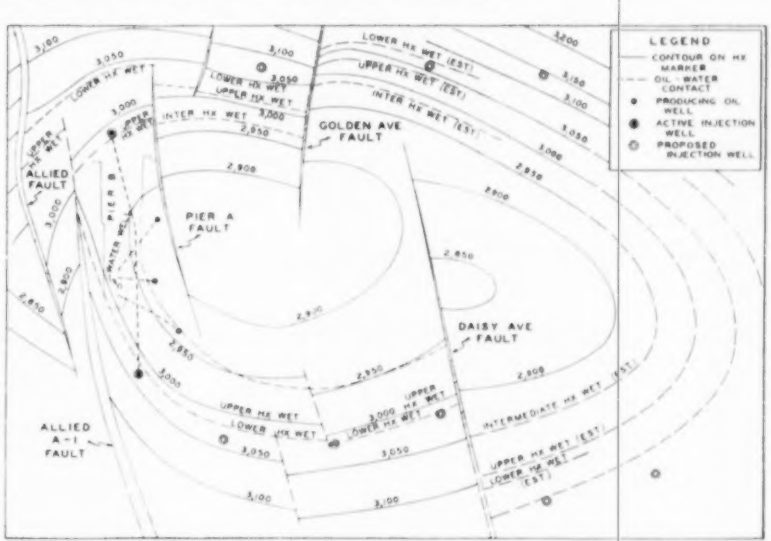
Discounting the laboratory tests to recoveries experienced by other water-injection programs indicates an additional 13 to 26 per cent of the total oil in place might be recovered by the flood. Or the project may result in an added oil recovery between 230 and 460 bbl. per acre-foot of sand, or approximately 500,000 bbl. more for the subpool.

Water supply . . . Use of ocean water or available oil-field brines was first considered. As both had disadvantages it was decided to drill a shallow water well on Pier B, only a short distance from the surface equipment of the two injection wells.

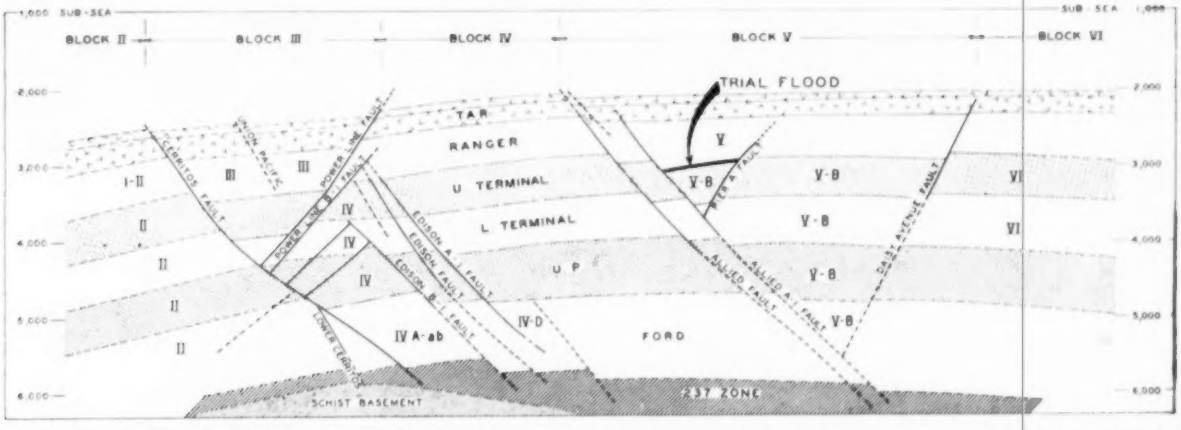
A 24-in. hole was drilled to a depth of 122 ft. and 11¾-in. pipe set to bottom. Perforated sections were set



MAJOR FAULTS and limits of production in upper Terminal zone. The small-scale flood is under way between the Allied A-1 and Pier A faults. Fig. 1.



BOTTOM-HOLE LOCATION of producing and injection wells involved in the first Wilmington flood. Structure shown is on the top of the HX sand in the upper Terminal zone. Fig. 3.



EAST-WEST CROSS-SECTION through Wilmington field in vicinity of where the water-injection project is under way. Extensive faulting will facilitate flooding by fault-block pools. Fig. 2.

at three intervals below 47 ft. and the hole flow-packed with 400 sacks of 0.043-0.057-in. gravel. Three strings of tubing, 1, 2½, and 5-in., were run.

The 1-in. was perforated at 41-42, 61-63, and 106-111 ft. to introduce chemicals into the well. The 2½-in. string was perforated between 81 and 111 ft. to obtain fluid levels in the gravel. A five-stage turbine pump, driven through shafting by a 7½-hp. motor, was set in the 5-in. tubing at 110 ft. and suction extended to 120 ft.

Production tests showed the well had a capacity of 11,500 bbl. of water daily. This rate resulted in complete drawdown of the fluid level in the casing, but with only a 33-ft. drawdown in the gravel. Through increasing the perforations, it is expected the well's output can be raised to 20,000 bbl. daily. That the producing rate varies slightly with the height of the tide, indicates the sands are replenished from the ocean.

Analyses show the water is identical in composition with ocean water. It contains no dissolved oxygen, algae, solids, or hydrogen sulfide, and has a low bacterial count. Its sulfates content is about 2,400 p.p.m. These react with the 40 p.p.m. of barium contained in the formation waters to form insoluble barium sulfate. Experience to date, however, indicates this does not offer a serious formation-plugging problem.

To assure it does not occur, and to prevent the precipitation of scale, sodium hexametaphosphate is added at the rate of 5 p.p.m. The chemical is introduced into the annulus of the water well by an electrically driven pump.

While water is free of oxygen, early experience showed a moderate corrosion problem existed as the iron content ran approximately 2 p.p.m. Thus a corrosion inhibitor also is being injected down the tubing.

A 6-in. line carries the water from the well to the suction of the injection pump, an engine-driven Aldrich triplex capable of delivering 4,500 bbl. per day at 1,090 psi. pressure. A trap removes any sand or other foreign material, preventing it from entering the pump. Discharged brine branches into two 3-in. lines which lead to the injection wells.

Injection wells . . . Two injection wells were drilled from adjacent surface locations on Pier B and deflected to the bottom-hole flank locations shown in Fig. 3. They were bottomed some 4,100 ft. apart, and about 50 ft. below the oil-water contact in the upper HX sand. Both were completed with 7-in. casing set on bottom. Bell holes were provided to prevent the casing from being sheared by earth slippage.

Well Z-228, the south-flank well, was drilled through the HX sands and bottomed about 300 ft. below. The north flank well, Z-229, was bottomed just below the base of the HX interval. In both, the casing was gun perforated at the interval HX to HX + 60 ft., using one ⅜-in. shot at 2-ft. intervals.

The two 3-in. lines carrying brine from the producing well are manifolded at the injection-well site, to give added flexibility. In the lines that lead from the header, throttling valves are installed to permit regulation of flow to the individual wells. Orifice meters are placed in both lines to measure the water input.

At the end of October approximately 400,000 bbl. of brine had been injected into the subpool. Rate of injection was approximately 2,000 bbl. daily to each well. Well-head pressure on Z-229 and about 225 psi. and that on Z-228, which first took water at a vacuum, was approximately 15 psi.

At that time the reservoir had received sufficient water to be approaching the theoretical fluid fillup neces-

TABLE 1—PARTICIPATION OF CITY OF LONG BEACH IN FAULT BLOCK POOLS OF THE TERMINAL AND HARBOR AREAS
(Data as of July 1953)

	Lar		Ranger		U. Terminal		L. Terminal		Deeper zones		Total	
	No. wells	Prod. (B/D)	No. wells	Prod. (B/D)	No. wells	Prod. (B/D)	No. wells	Prod. (B/D)	No. wells	Prod. (B/D)	No. wells	Prod. (B/D)
BLOCK 1:												
City	←		9	321	←		←		1	22	10	343
Others	←		136	5,866	←		←		47	1,486	183	7,352
Total	←		145	6,187	←		←		48	1,508	193	7,695
BLOCK 2:												
City	22	1,065	←		15	1,280	←		5	176	42	2,521
Others	103	2,544	←		97	10,749	←		51	1,327	251	14,620
Total	125	3,609	←		112	12,029	←		56	1,503	293	17,141
BLOCK 3:												
City	35	1,828	←		10	1,643	2	33			47	3,504
Others	72	3,133	←		42	9,830	19	2,479			133	15,442
Total	107	4,961	←		52	11,473	21	2,512			180	18,946
BLOCK 4:												
City	29	1,687	58	3,542	103	5,773	←		93	2,556	283	13,558
Others	18	497	103	1,777	170	12,987	←		68	1,943	359	17,204
Total	47	2,184	161	5,319	273	18,760	←		161	4,499	642	30,762
BLOCKS 5, 5A:												
City	50	3,859	110	4,750	←		13	790→	8	978	181	10,377
Others	1	20	141	1,902	←		4	44→			146	1,966
Total	51	3,879	251	6,652	←		17	834→	8	978	327	12,343
BLOCK 5B:												
City					89	7,456	35	3,937	12	1,927	136	13,320
Others					13	146					13	146
Total					102	7,602	35	3,937	12	1,927	149	13,466
BLOCK 6:												
City			15	753	24	3,908	16	2,859	6	1,370	61	8,890
Others			59	1,958	1	22					60	1,980
Total			74	2,711	25	3,930	16	2,859	6	1,370	121	10,870
AREA TOTAL:												
City											760	52,513
Others											1,145	58,710
Total											1,905	111,223

sary to replace withdrawals of oil, gas, and water. This was not believed to be the case, however. There were indications some water was being lost to other fault blocks.

It is still too early to predict how successful the project will be in promoting additional oil recovery. Primary indication that it may be successful is a drop in gas-oil ratios. After 400,000 bbl. of water had been returned, average ratio was 120 cu. ft. per barrel as compared with 260 cu. ft. prior to the project's inception.

Field-Wide Flood Possibilities

Preliminary studies sponsored by the Long Beach Harbor Department indicated the field's upper zones, the Tar, Ranger, and upper and lower Terminal, under primary production methods will yield in the order of 15 or 20 per cent of the oil in place. Water injection, coupled with crestal gas injection in some reservoirs, is hoped will result in this recovery being doubled.

A secondary purpose of injecting water, possibly as important as stimulating oil recoveries, would be to check or reduce land subsidence. Sections of the city of Long Beach bordering the field in the east have not been materially affected but the matter is of great concern in the Terminal and Harbor areas. Subsidence at one point in this area has resulted in the land surface dropping by more than 18 ft.

A portion of the sinking is believed to be due to lowering of the basement itself, and to tectonic movements. Extensive studies conducted by researchers of the California Institute of Technology, however, relate most of the subsidence to compaction of the oil zones following withdrawals of fluid and gas.

The studies show sinking is greatest where withdrawals have been heaviest; that compaction has occurred principally in the Tar, Ranger, and Terminal zones. Maintenance of reservoir pressures thus will have a twofold purpose since the reports predict continued subsidence if pressure depletion is not checked.

Water injection at Wilmington is expected to have a better chance for success than has been experienced at Dominguez, Brea, Richfield, and other Los Angeles Basin fields where trial floods have proved none too successful. Wilmington's oil zones are far more permeable; they will take the required quantities of water at much lower pressures, it is believed.

Several factors, however, may limit wide-scale water injection. One has to do with the oil formations themselves. They are much thicker than those in Mid-Continent fields where flooding has been successful. Individual sands

(Continued on page 90)

TABLE 2—DATA ON UPPER OIL ZONES OF FAULT BLOCK 4

	Tar			Ranger			Upper Terminal			Lower Terminal		
	City	Others	Pool	City	Others	Pool	City	Others	Pool	City	Others	Pool
Prod. wells	29	18	47	58	103	153	103	170	273		(*)	
Prod. area, acres	250	250	500	560	570	1,130	310	350	660	240	365	605
Developed area, acres	250	250	500	480	570	1,050	310	350	660	240	365	605
Avg. zone thick., ft.			300	300	280	290			700			500
Avg. sand thick., ft.			100	123	97	109			330			260
Porosity, %	37		37	40		40			32			32
Permeability, md.			1,230			1,700			700			450
Interstitial water, %	21		21	22		22			25			29
Oil production, B/D	1,687	497	2,184	3,542	1,777	5,319	5,773	12,987	18,760		(*)	
Est. tank oil in place, 1,000 bbl.			100,000			279,000			361,000			238,000
Est. primary recovery, 1,000 bbl.			6,000			45,000			190,000		(*)	
Initial crude vis., cp.			400			10			10			3
Avg. gravity, °A.P.I.			14			17			21			27
Est. initial reservoir pressure, psi.			1,100			1,210			1,460			1,675
Avg. current reservoir, pressure, psi.	750			700	100	390	300		220	200		180
Avg. G.O.R.			1,000			880	675		620		(*)	
Avg. water cut, %			30			16			38		(*)	

*Many producers completed in both upper and lower Terminal so that data by zones not available.

TABLE 3—DATA ON UPPER OIL ZONES OF FAULT BLOCKS 5, 5A, AND 5B

	Tar			Ranger			Upper Terminal			Lower Terminal, 5B		
	City	Others	Pool	City	Others	Pool	City	Others	Pool	City	Others	Pool
Prod. wells	50	1	51	110	141	251	102	17	119	35	0	35
Prod. area, acres			750	1,020	650	1,670	383	50	423	380	0	380
Developed area, acres			550	620	650	1,270	383	50	423	380		380
Avg. zone thick., ft.			275			350			374			308
Avg. sand thick., ft.			190			140	276	60	276			188
Porosity, %			39			36			33			30
Permeability, md.			3,350			*1,000			506			266
Interstitial water, %			15			22			29			37
Oil production, B/D	3,859	20	3,879	4,750	1,902	6,652	8,246	190	8,436	3,937	0	3,937
Est. tank oil in place, 1,000 bbl.			406,000			300,000			196,000			93,000
Est. primary recovery, 1,000 bbl.			40,000			60,000			30,000			20,000
Initial crude vis., cp.			400			11			10			4
Avg. gravity, °A.P.I.			14			18			20			24
Est. initial reservoir pressure, psi.			1,100			1,210			1,450			1,670
Avg. current reservoir pressure, psi.			775	500	100	300			450			600
Avg. G.O.R.	1,135		1,135			875			1,030			1,400
Avg. cut, %	30		30			15			42			25

*Estimated.

SCOPE OF PROCESSING at Cosden Petroleum Corp.'s Big Spring, Tex., refinery is indicated in this block flow diagram. The area in upper right, shown in black, indicates B.T.X. manufacture, which is the latest step in the plant's program of product diversification. Fig. 1.

PETROCHEM REPORT:

Small Refinery, But Big Products List

Petrochemical Flexibility at Big Spring . . .

- Simultaneous Udex extraction of benzene, toluene, and xylene in B.T.X. plant.
- High flexibility in blocked-out Platformer operation for aromatics and high-octane motor-fuel manufacture.
- Economically proven aromatics operation at average charge rate to Platformer of 3,300 bbl. per day.
- Over 2,000 bbl. per day of aromatic platformate charged continuously to Udex unit. Recovery is 94.5 per cent of total aromatics in Udex charge.
- Over 900 bbl. per day of highly pure benzene, toluene, and xylene separated by continuous distillation in three-column superfractionation train without separate rerun.

by John C. Reidel
Petrochemical Editor

AN important step in the products diversification program of Cosden Petroleum Corp. was the construction of Universal Oil Products Co. Platformer-Udex facilities. These went on stream at the Big Spring Tex., refinery in September 1952.

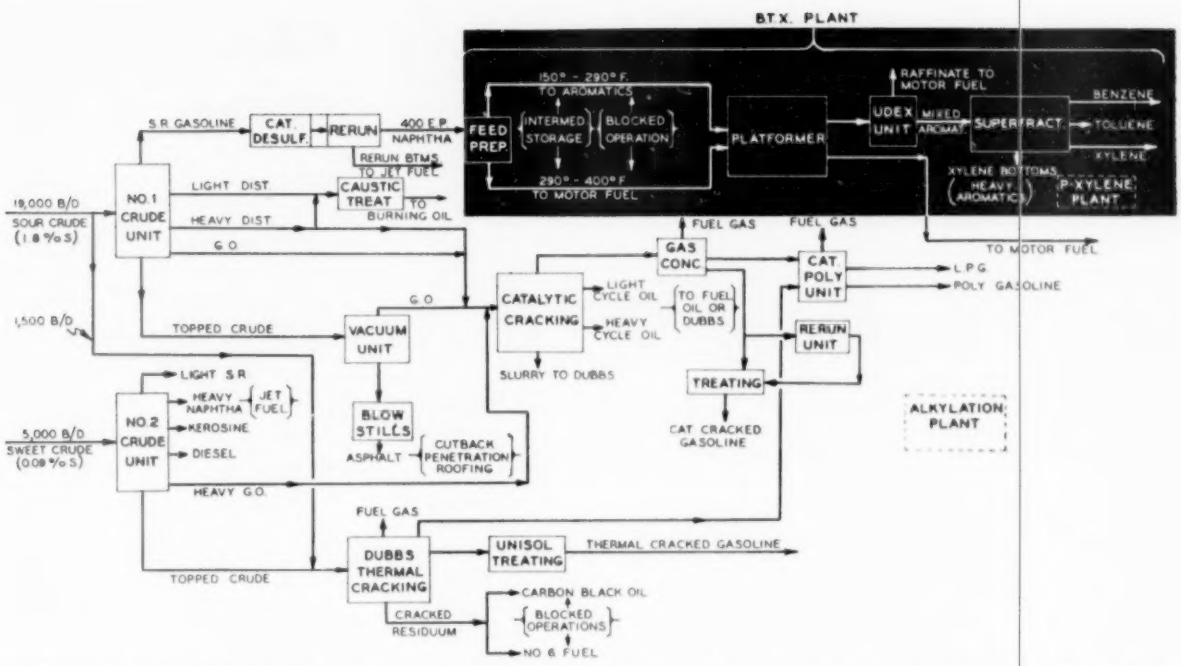
Since then the Udex solvent-extraction unit has proved itself economical in continuous manufacture of better-than-nitration-grade benzene, toluene, and xylene. In fact, the xylene is of such high purity that it would have to be adulterated with 4 per cent of paraffins to meet nitration-grade gravity specifications. This is the first instance of simultaneous manufacture of high-purity benzene, toluene, and xylene from a petroleum source.

Simultaneous Udex extraction of these three aromatics, with high selectivity, is an important feature of the Cosden installation. This results in reduced heat requirements and simplification in solvent-extraction-unit equipment.

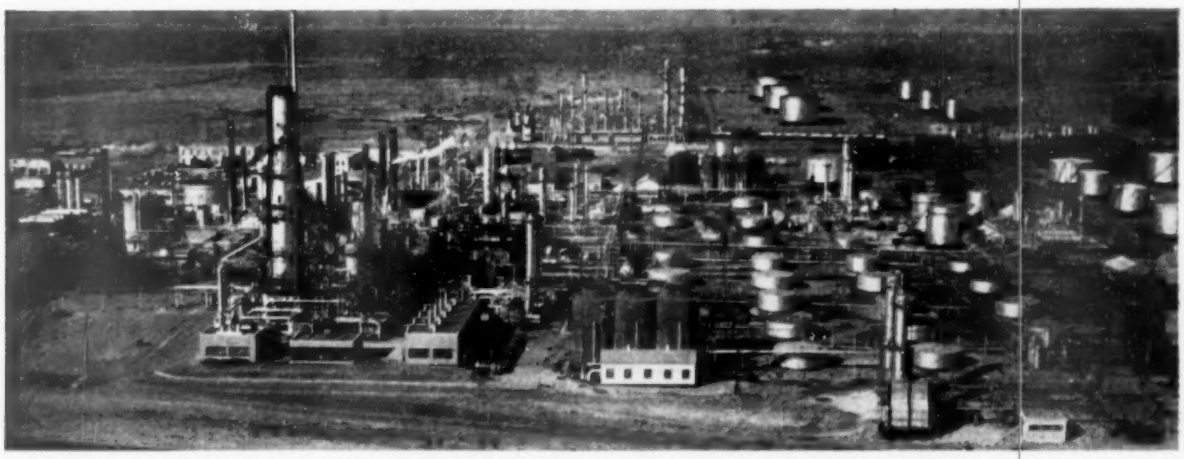
Following solvent recovery, the Udex extract is clay treated to meet acid-wash color test. This is followed by superfractionation into the individual aromatics. It is believed that this is the first time the three pure aromatics have been separated by continuous distillation in a three-column train without separate rerun. One of the features that makes this difficult separation possible is the process instrumentation employed, including pressure-compensated reflux temperature control.

1—MAKING AROMATICS BY PLATFORMING

How the B.T.X. (benzene, toluene, xylene) operation is integrated into Cosden's over-all refinery processing is indicated in Fig. 1. The refinery has a nominal crude charging capacity of 24,000 bbl. per day. Present crude run, in slightly cutback operation, includes 17,500 bbl. daily of mixed Howard-Glasscock and East Howard 30° A.P.I.



B.T.X. PLANT, showing Platformer heaters, compressors shelter, and control room across front and feed-preparation, extraction, and fractionation columns.



BIG SPRING REFINERY of Cosden Petroleum Corp. Process facilities include U.O.P. fluid catalytic cracking unit operating at a total capacity of 10,000 bbl. daily.

sour crude oil. Most of this goes to the No. 1 atmospheric distillation unit, but 1,500 bbl. daily is charged directly to Dubbs thermal cracking.

Sour-crude operation . . . The No. 1 crude unit consists of a desalter, two fractionating columns, and flash tower. The first crude-fractionating column takes straightrun gasoline overhead which is later combined with gasoline overhead from the second fractionating column. No side cuts are taken on the No. 1 column. A portion of the bottom from this column goes through one coil of a heater and returned as reboil to the column. The remainder of No. 1 fractionating column bottoms goes through another coil in the heater and to the flash tower.

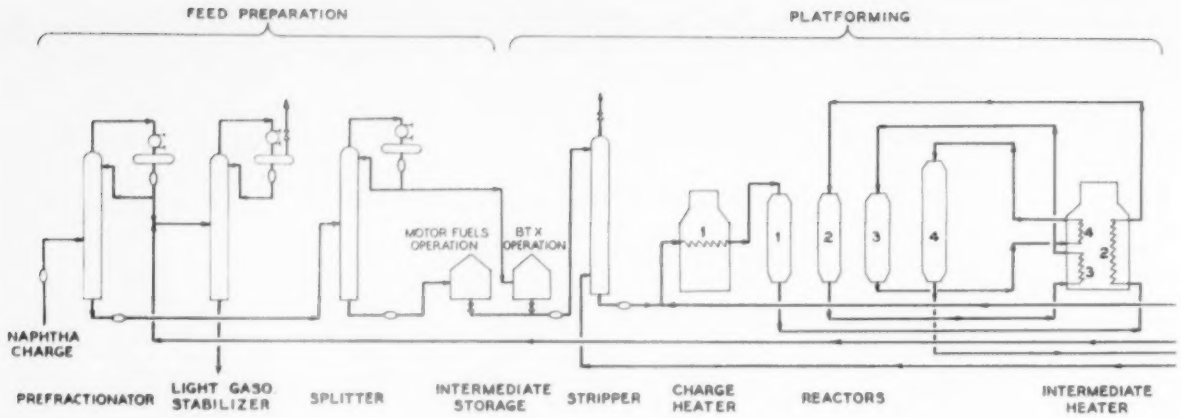
Residue from the flash tower (topped crude bottoms) is fed to the vacuum unit, while flash-tower overhead goes to the No. 2 fractionating column. This takes gasoline overhead and light and heavy distillates as side cuts. Low-gravity gas-oil bottoms from No. 2 fractionating column go to catalytic cracking.

B.T.X. and Motor Fuels

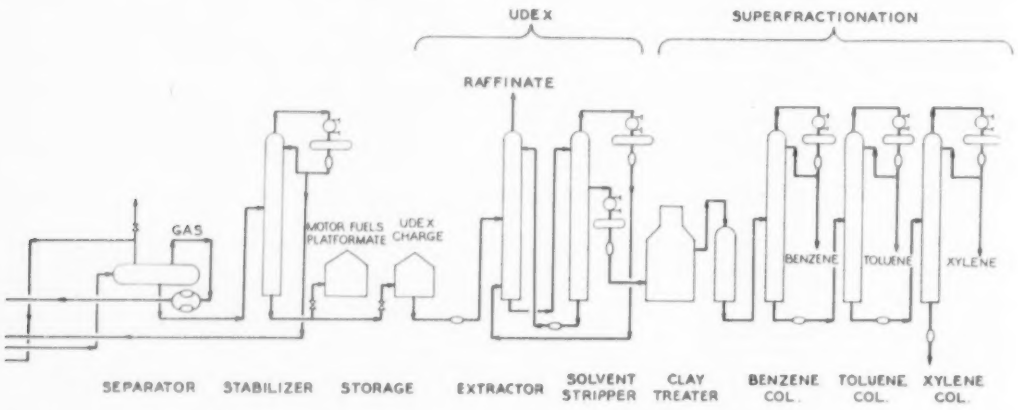
The sour straightrun gasoline goes through diethanolamine solution in a packed column. Following contact with DEA it goes through a heater and clay towers (two towers operated singly or in parallel) where the material is catalytically desulfurized. This is followed by a rerun column in which the straightrun gasoline is cut for end point, making a highly naphthenic 400-e.p. fraction for charge to the B.T.X. plant.

The B.T.X. operation includes these steps: (1) feed preparation, (2) Platforming, (3) Udex extraction, and (4) superfractionation.

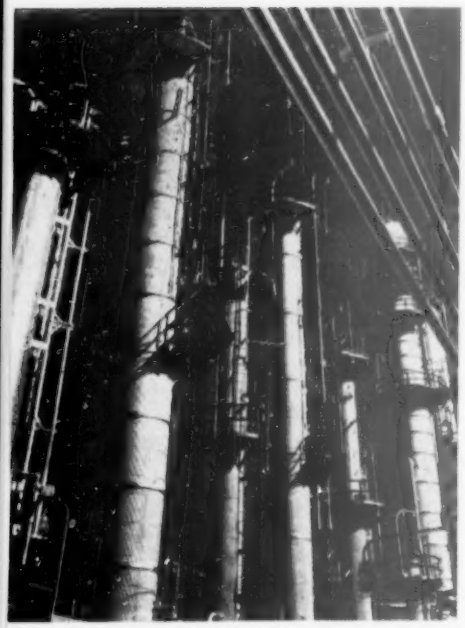
Feed preparation . . . This is a three-column operation (Fig. 2) in which some 4,000 bbl. per day of the desulfurized 400-e.p. naphtha is charged to the prefractionator where it is cut for i.b.p. (depentanized). Overhead from this column is stabilized (debutanized)



Facilities for production of benzene, toluene, and xylene . . .



are outlined in this simplified flow diagram.



Closeup of fractionators: charge stripper, toluene column, light straightrun stabilizer, benzene column, xylene column, Udex stripper, and Udex extractor.

in the light straightrun stabilizer and goes into gasoline blend. The prefractionator bottoms are pumped to the 40-tray splitter column which, in present operation, makes a 150°-290° F. light naphtha for aromatics manufacture and a 290°-400° F. heavy naphtha for motor-fuel operation. These fractions go to intermediate floating-roof storage.

Platforming . . . The Cosden Platformer operates with a charge heater, four reactors, and multicoil interheater as shown. This arrangement gives best temperature control for the naphthene-to-aromatic conversion which is highly endothermic reaction. To balance operations for continuous Platformer runs on available light and heavy naphtha feed, a blocked-out operation is employed with approximately two-thirds of run on aromatics production.

The remaining portion of the run is reserved for reforming of the heavy-naphtha charge to high-octane motor-fuel material. Stabilized platformate yield, in the reforming operation, has been at about 95 volumes per cent of charge. Stabilized platformate has a leaded F-1 octane number of between 95 and 96. The charge to the Platformer in reforming operation for motor fuel has been about 5,500 bbl. per day.

Aromatics yield . . . For aromatics manufacture, the average charge rate to the Platformer has been 3,300 bbl. per day. Naphthenes and aromatics together constitute some 48 per cent of the light-naphtha charge. Conversion is 97 per cent as measured by naphthene disappearance. (If conversion is figured on aromatics appearance it can show over 100 per cent due to dehydrocyclization of paraffins).

High flexibility . . . When producing aromatics, operating conditions are such that (1) maximum isomerization is obtained of five-carbon to six-carbon cycloparaffins, and (2) dehydrogenation of these six-carbon naphthene rings to aromatics takes place. These reactor conditions are considerably different from those employed when making platformate for motor fuel. Jackson and Krausse[1] state that the Cosden Platformer has shown high flexibility in

making the changeover from one set of operating conditions to the other. They say, "New process conditions and specification products can be established in from 3 to 4 hours without production of slop cuts."

Catalyst life is stated to be 76 and 80 bbl. per pound, these data having been obtained on the first and second Platformer runs, respectively. Average catalyst cost is, accordingly, 6.4 cents per barrel of charge.

2—SEPARATING AROMATICS BY UDEX

Aromatic platformate is depentanized in a stabilizer and sent to Udex unit floating-roof charge tank. The Udex unit operates continuously, with aromatic platformate charged to it at an average rate of over 2,000 bbl. per day. Feed enters the Udex extractor column approximately at midpoint. Special-design U.O.P. contacting trays are employed in the extractor. The diethylene glycol-water solvent enters at the top of the extractor while light hydrocarbon recycle is returned as reflux to the bottom of the extractor.

Type separation . . . In the extractor, countercurrent contact is maintained between descending DEG solution and ascending hydrocarbon. Separation of benzene, toluene, xylene, and heavier aromatics from the nonaromatic hydrocarbons is therefore accomplished on the basis of the differences in chemical type rather than differences in relative volatility. Distillation alone would not be feasible for this separation due to occurrence of minimum-boiling azeotropes.

The raffinate leaving the top of the extractor is a paraffinic concentrate, containing 4-5 per cent aromatics. It is water washed to recover a small amount of DEG solvent and goes to storage to be used in gasoline blending. The rich solvent phase (extract), leaving the bottoms of the column, contains less than 0.2 per cent nonaromatics.

Stripping . . . Aromatic extract goes to solvent recovery, with light hydrocarbons stripped off in an atmospheric flash at the top of the solvent stripper and are recycled back to the extractor. DEG is recovered from the bottom of the reboiled stripper column. A solvent regeneration system is part of the Udex facilities, operating on a slipstream of the DEG solution. Mixed aromatics are taken off the side of the solvent stripper to clay treating.

Udex yields . . . Typical recoveries of aromatics in the Udex extraction have been given as:

	Per cent
Benzene	99
Toluene	98
Xylene	94
Heavier	85

Over-all yield of total aromatics by the Udex extraction has averaged 94.5 per cent.

Simultaneous extraction . . . This feature of the Udex process leads to considerable process simplification and savings in equipment. Reduction in heat requirements is obtained by operating the extractor and solvent stripper at essentially the same temperature. This then minimizes the sensible heat load on circulating solvent stream. Additional reduction in heat requirements is obtained as a saving in latent heat of vaporization due to the high boiling point of the DEG, since a more volatile solvent would be vaporized and distilled off from the aromatics while with DEG it is possible to do the opposite—take off the aromatics leaving the unvaporized DEG to recirculate from the bottom of the stripper. Other factors which militate in favor of DEG as principal component of the Udex solvent are:[2] (1) high solubility and selectivity for aromatics, (2) low solubility in nonaromatic hydrocarbons, (3) stability at operating conditions, and (4) noncorrosive properties. The water in the Udex solvent acts as a stripping medium so that stripping can be conducted at atmospheric pressure and not too high temperature. Use of water also permits adjustment of selectivity and solubility as desired.

Clay treating . . . To meet the A.S.T.M. acid-wash color specification, clay treating is employed. This has a number of advantages over treatment with 93 per cent sulfuric acid or over diolefin extraction. With simultaneous extraction of aromatics by Udex, one-step clay treating is made possible. The aromatic concentrate is heated and passed over clay at polymerizing conditions, reducing acid-wash color from 10 to between 0 and 1, and obtaining considerable reduction in olefinic unsaturation. Product loss is very small in clay treating. Clay life in the Cosden operation has been better than 8,000 bbl. per ton, or a total cost of about 25 cents per barrel, according to Jackson, Chadd, and Krausse.[3]

3—SUPERFRACTIONATION—A CONTROL PROBLEM

Separation of aromatics is accomplished in three 40-tray columns, each operating at about 5-psi. pressure, and taking high-purity benzene, toluene, and xylene overhead, respectively. This is made possible by: (1) the very low concentration of nonaromatics in the Udex extraction, and (2) the instrumentation specially developed for this process, details of which have not yet been released.

Pure aromatics . . . The problem of making nitration-grade benzene and toluene (less than 1.0° C. boiling range) and 3° C. boiling-range xylenes from a three-column distillation train has been reviewed by Fenske and Broughton.[4] Contamination with adjacent aromatic must be kept to less than 0.1 mole per cent. This is equivalent to a change in the boiling temperature of benzene of only 0.035° F. at constant atmospheric pressure or of 0.6 mm. Hg vapor pressure at the constant boiling temperature of 176.2° F.

This difficult control problem has apparently been overcome by careful determination of the optimum control point in each superfractionation column so that temperature measuring element may be properly located at the point where there is greatest change in temperature per unit change in overhead product composition. Along with this, pressure compensation can be employed by either (1) a vapor pressure comparison method, or (2) by measuring temperature of liquid on control tray and comparing with standard such as pure benzene boiling in separate container open to the column.

Reagent grade . . . Cosden's benzene and toluene are of higher purity than that set by the A.S.T.M. nitration-grade specifications. They have been found to meet completely the A.C.S. reagent grade specifications.[1] Careful check has been made with both A.S.T.M. and A.C.S. purity standards on the basis of freezing point for benzene and on the basis of maximum paraffin content for toluene. In the case of benzene it has been found important to provide dehydration facilities between storage and loading rack to insure that benzene shipments will be bone-dry.

In the case of xylene, the material made by Cosden has a higher specific gravity than the maximum specified by the A.S.T.M. standards. If 4 per cent of paraffin is added to the Udex-extracted xylene, which has been superfractionated for a 3° C. boiling range, nitration-grade gravity specifications can be met, while also meeting the A.S.T.M. specifications as to maximum paraffin content.

Xylene bottoms . . . These bottoms from the last column in the superfractionation section are a heavy aromatics fraction consisting of compounds with nine and more carbon atoms. At present this material goes to the slop tank and eventually ends up in Dubbs ther-

(Continued on page 91)

OPERATING THE CAT CRACKER—3

How Conversion Level Affects Product Distribution

- Cat cracker performance depends on a number of important interdependent operating variables.
- A better understanding of these variables will in many cases show how the cat cracker can be operated at increased capacity and or increased yields.
- Extent of conversion is the first of these variables discussed in this continuing series.
- Relationships showing effect of extent of conversion on yields are presented.

by J. W. Moorman

THE performance of any catalytic cracking unit is dependent entirely on the separate and combined effects of the operating variables that control unit capacity and product distribution.

Different people have different philosophies and techniques in the operation of catalytic cracking units. A rather wide survey of existing catalytic cracking units both of the T.C.C. and fluid types has demonstrated considerable variance in operating technique and understanding of the basic operating variables. It is believed that in many cases a clearer understanding of the effects of these variables will permit increased capacity and/or increased yields.

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Difficult to evaluate . . . Throughout the years of the development of the catalytic cracking processes, it has been possible through pilot-plant and commercial operations to isolate the individual effects of the various controlling variables. On a commercial unit this is often a difficult task due to the type of design, the control system, and such other factors as the cost of experimentation on a commercial scale. Consequently, the results that have been observed on some commercial plants have not agreed with those observed on other commercial units.

Nevertheless, when such data are correlated and further related to pilot-plant studies, it has been found basically, these data, although obtained on different units are in reality identical —provided other operating variable have been taken into consideration.

What Are the Important Variables?

Following is a list of the important variables that have been found to be extremely important in both the design and operation of any catalytic cracking unit:

1. Extent of conversion
2. Space velocity
3. Catalyst to oil ratio
4. Feed preheat
5. Reaction temperature
6. Catalyst activity
7. Carbon on catalyst
8. Feed-stock quality
9. Extent of recycling
10. Pressure.

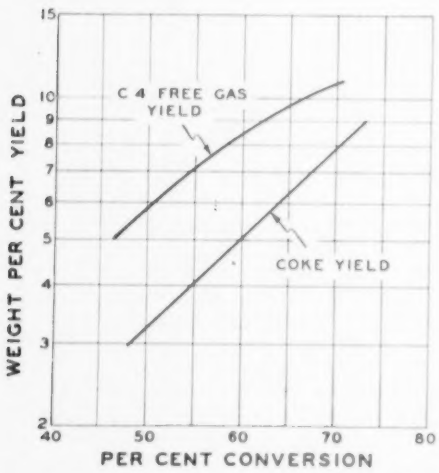

Fig. 1—Relation between extent of conversion and coke and dry-gas yields at constant catalyst activity and reactor temperature.

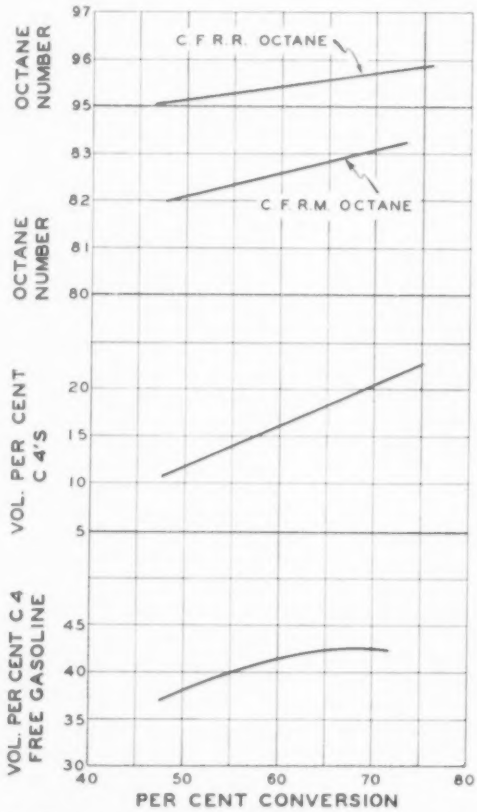

Fig. 2—Conversion related to yields of debutanized gasoline and butanes, and gasoline octane numbers.

As noted, is has been possible to isolate the above variables by carefully controlled operating conditions in both pilot-plant and commercial operations. In each case the effect of a given variable has been determined under conditions in which all other variables were held constant except those required to change the specified variable. As a result the available information can be of use only from a qualitative viewpoint especially since a large portion of the information was obtained under pilot-plant conditions. Furthermore, quantitative data obtained on a given commercial unit are not necessarily applicable to another unit due to difference in operations, feed stock, etc.

However, it can be definitely demonstrated that such study of the effects pro-

duced by changes in the operating variables can assist in predicting performance of a given commercial plant, with resultant improvement in unit capacity and product distribution.

What Is "Conversion?"

Conversion is defined as the volume of the feed converted to products other than cycle gas oil. Generally, cycle gas oil is considered to be material above 400° F. A.S.T.M. end-point motor gasoline. However, it has been found that a better indication of the true end point should be taken as the 430° F. cut point on a t.b.p. distillation of the total liquid product. In this manner, it has been found that essentially all of the gasoline that might be included in the cycle oil can be included as gasoline yield and consequently present a more accurate conversion level.

Thus an accepted method of calculating conversion may be expressed as follows:

$$\text{Conversion} = \frac{(430^\circ \text{ VT corrected}) \; (100\text{-Vol. \% Naphtha in Feed}) - \text{Vol. \% Cycle Stock}}{100\text{-Vol. \% Naphtha in Feed}}$$

This is equivalent to assuming naphtha in the feed is unaffected and calculating percentage conversion of original gas oil to other products. This assumption is admittedly in error since naphtha can be reacted. However, under normal operating conditions the cracking of virgin naphthas to coke and gas is of a mild nature so that the error that might be introduced is of little significance.

So long as only one feed stock is involved it appears that the 430 conversion in the above manner would be a good measure of the amount of feed reacted but where widely different feed stocks are involved this can be somewhat in error. For instance, a feed stock having a 500° F. initial boiling point must actually be converted considerably above the calculated value in order to show a 430 conversion. This is because the product boiling between 430° and 500° F. is considered as being unreacted feed whereas it is actually cracked material. However, from a practical viewpoint and when considering most present-day operations for the production of motor gasoline, it is believed that the 430 conversion can be utilized in most cases since it is normal practice to crack catalytically all virgin gas oils boiling above 400° F. end-point gasoline.

How Much Coke Will Be Produced?

The conversion level is one of the most important factors in determining the amount of coke produced from a given feed stock and the yields of gasoline and lighter products. The effect of conversion level on coke yield with all other conditions constant can be illustrated as follows:

Per cent conversion	Wt. per cent coke
50 per cent	4.0
55 per cent	5.0
60 per cent	6.4

The above were determined for specific conditions and for once-through operation and the conversion level was varied by changing the Severity Factor (Catalyst to Oil Ratio/Weight Space Velocity). A study of these data demonstrates that for a given unit having a fixed regenerator capacity the feed rate to the unit can be varied over a wide range depending upon the conversion level. Thus, a unit designed for 50 per cent conversion and 15,000 bbl. per day would only be able to process 12,000 bbl. per day at 55 per cent conversion. The choice of the proper conversion depends upon the refinery conditions, feed-stock quality, and availability of feed.

Conversion Level and Yields

Fig. 1 gives the relationship between extent of conversion and the coke and dry-gas yield under constant conditions of catalyst activity and reactor temperature. Fig. 2 presents the relationship between extent of conversion and the yields of C_4-free gasoline and butanes and the gasoline octane numbers.

Here it will be noted that on a once-through catalytic cracking operation the gasoline yield appears to reach a maximum and the increase in gasoline octane number is relatively small. The latter is contrary to the opinions of many operating companies in which it is believed that increasing the extent of conversion will materially increase the octane number of motor gasoline.

In the case of the aforementioned correlation the only factor that was varied was the Severity Factor (Catalyst to Oil Ratio/Weight Space Velocity), all other conditions such as reactor temperature, catalyst activity, catalyst type, feed stocks, etc., having been held constant.

An examination of Figs. 1 and 2 indicates that the extent of conversion at a given temperature level is of extreme importance not only as regards unit capacity for a specific regeneration capacity but also from the standpoint of product distribution. It is also obvious from the above that unit capacity expressed in terms of barrels per day of gasoline from a given unit is dependent primarily upon the conversion level and the availability of virgin gas oil.

What Affects Conversion Level?

The extent of conversion of a given gas oil in the catalytic cracking process is dependent upon the following factors:

1. The severity factor (the catalyst to oil ratio/the space velocity)
2. Reaction temperature
3. Catalyst activity

As noted, the data presented in Figs. 1 and 2 have been predicated upon the change in severity factor. The second important variable is that of reactor temperature. From the available information on the fluid type of catalytic cracking process, it is indicated that for every 10° F. rise in temperature at constant severity conditions the extent of conversion will increase in the range of 0.7 to 1.0 per cent. Expressing it in another way, increasing the severity factor by 25 per cent will increase conversion approximately 3 per cent, based upon fresh feed. The latter is equivalent to an increase of 30°-45° F. of reaction temperature which, as will be pointed out later in this series, will have a material effect upon product distribution and refinery disposition of products.

Though the above were determined quantatively from fluid catalytic cracking operations, a review of the published information on Houdriflow and T.C.C. has indicated that the trends are identical with those experienced in fluid catalytic cracking, and variations being due to differences in nomenclature and control of equipment.

The third important variable in controlling the extent of conversion is that of catalyst type and catalyst activity. As an example, the relationship is presented between activity increase and the decrease in severity requirements to maintain the same conversion on a specific type of gas oil with all other operating conditions being constant:

Activity increase per cent D + L*	Per cent decrease in severity†
25-30	112.5
25-35	312
25-40	685

*Jersey "distillate + loss" method for catalyst activity. †Requirements for given conversion.

It can be seen of course, that a considerable amount of saving in severity requirements to obtain a given conversion can be realized by the use of higher activity catalyst. The economics of such an operation must be based upon the availability of feed stock, catalyst costs, design of unit, and the product distribution improvement that can be realized by the use of higher activity catalysts.

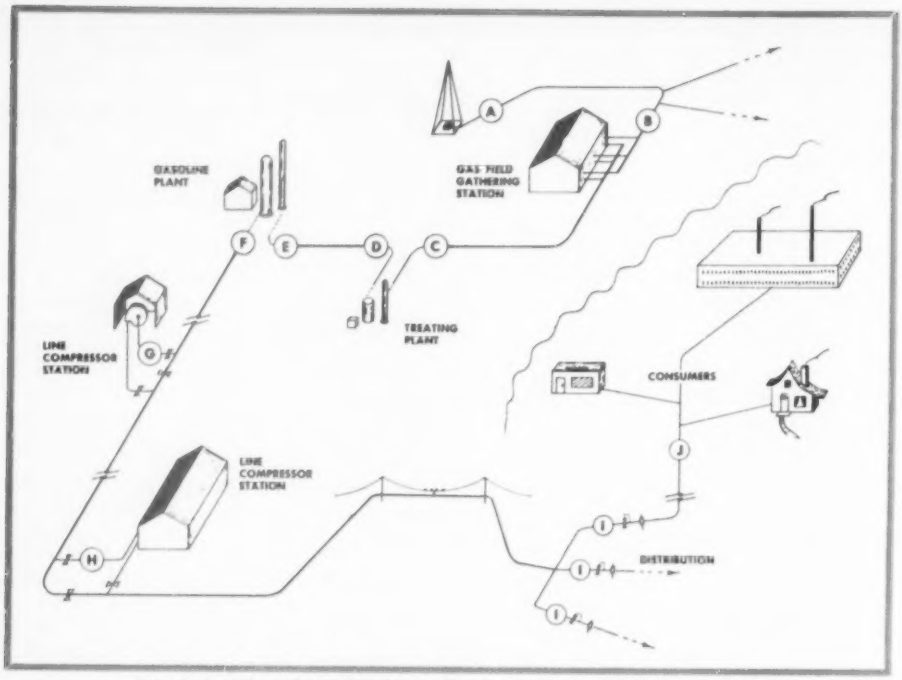

Fig. 1—Location of gas-cleaning equipment in a gas-transmission network.

LAUNDRY FOR PIPE-LINE GAS

Here's why the gas gets dirty, and how you can send it out clean

by Raymond C. Baird

FOR new pipe lines, the dirt-removal problem is relatively minor, especially in view of the almost universal application of gas treating which reduces H_2O and H_2S content to a degree where the oxides and sulfides, which would otherwise result, are practically nonexistent. However, welding slag and other contamination resulting from and during pipe-line fabrication usually pose a threat for some time after a new line is put on stream.[4,5]

Sooner or later iron oxide and/or sulfide particles may be expected to appear in spite of gas treating. This will occur after their relatively slow accumulation has reached a point where variation in pipe diameter and circularity of cross-section due to seasonal, diurnal, and weather-produced temperature changes and line-pressure alterations cause the oxide and sulfide films to flake off the pipe wall.

Liquids from gas-treating operations may be present, resulting from condensation or collection on the pipe walls downstream of the gas cleaners located on the plant discharge. Such liquids may have either passed through the cleaners as a vapor which then condenses on the cooler pipe walls, or resulted from mechanical carryover of fine liquid particles because of overload conditions. A major source of pipe-line liquid is the condensation of lubricating oil vaporized during operation of upstream compressors.

Author associated with Fluor Corp., Ltd., Los Angeles. Paper presented before fall meeting of C.N.G.A., 1953, as "Dirty Pipe-Line Gas—Its Cause and Cure in the Petroleum Industry."

Pipe-Line Transmission

A representative "system" of natural-gas transmission from well head to the ultimate consumer is shown in Fig. 1.

The field gathering station is usually close to the well head so that pressure loss from the well to the station is not critical. In some cases no compression is introduced ahead of the treating plant. Accordingly, gas-oil separators at the well head are usually quite satisfactory for separating gas and liquid phases at that point along with particulate matter "blown" out of the well by the effluent stream.

These separators can assume great proportions especially when installed for large oil fields.[1] The suction side of the field gathering station normally employs a cleaner of the knockout variety because there is no dust problem as such, the solid particles, if any, being trapped in oil film flowing along the pipe wall. The cleaner, therefore, may be simply a vessel where flow velocity is reduced and particulate matter settles or drops out under the influence of gravity. It is, in reality, a settling chamber housed in a pressure vessel.

Frequently gas-treating and/or gasoline plants are located close by the gas source. The purpose of treating plants normally is to dehydrate and/or "sweeten" the gas by removing water vapor and hydrogen sulfide, respectively. Heavier gaseous hydrocarbons are removed by the gasoline plants to a degree where the remaining onflowing gas is principally methane.

Effluent streams from these processing plants are passed through liquid-type gas cleaners (i.e., as contrasted with dirt-removing scrubbers) for two general purposes. One is to recover en-

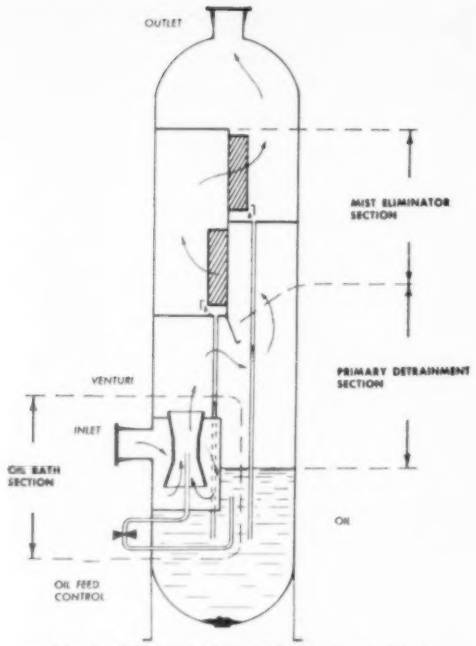

Fig. 2—Elements of an oil-bath-type scrubber.

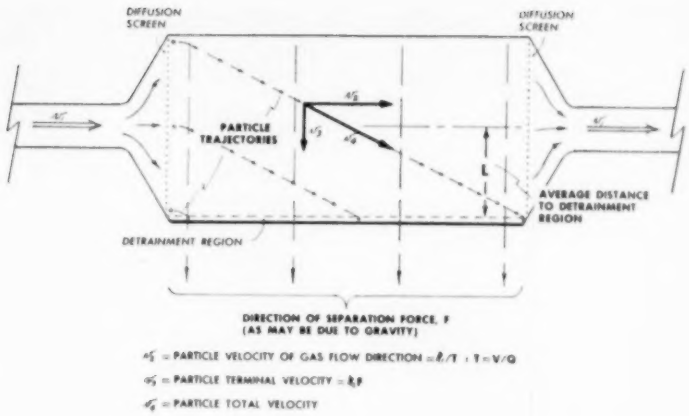
DIFFUSION SCREEN
DIFFUSION SCREEN
PARTICLE TRAJECTORIES
AVERAGE DISTANCE TO DETRAINMENT REGION
DETRAINMENT REGION
DIRECTION OF SEPARATION FORCE, F (AS MAY BE DUE TO GRAVITY)
= PARTICLE VELOCITY OF GAS FLOW DIRECTION
= PARTICLE TERMINAL VELOCITY
= PARTICLE TOTAL VELOCITY

Fig. 3—Fundamentals of detrainment.

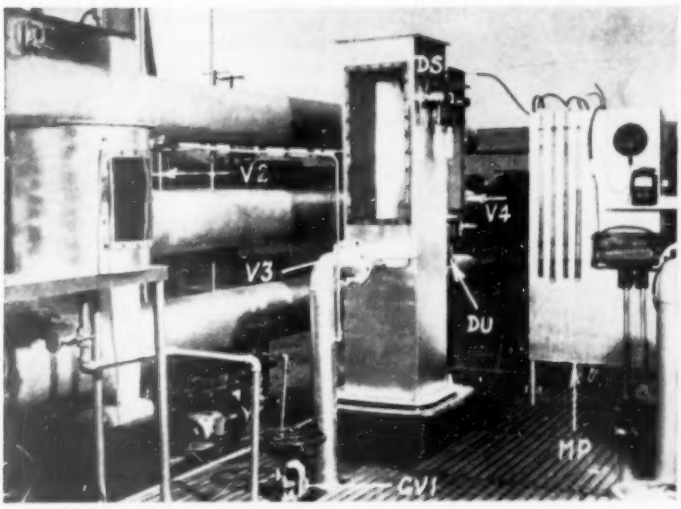

Fig. 4—Apparatus for laboratory mist-eliminator research.

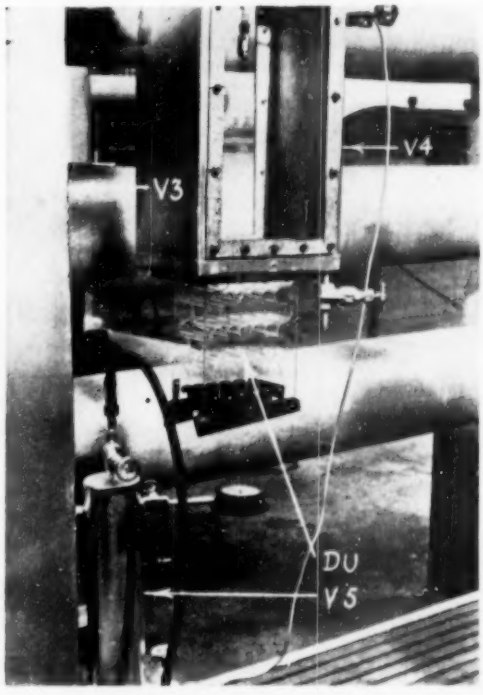

Fig. 5—Experimental mist eliminator.

trained processing fluids for reasons of economy and the other is to prevent impairment of pipe-line efficiency by liquid carryover.[2] Both factors may loom large in the economic picture.

It is from here on that the need for dirt removal assumes increasing importance, and continues so all the way down to and including the low-pressure distributing lines to the consumer. Table 1 sets forth the general cleaning requirements for the various points along the gas transmission network shown in Fig. 1. Table 2 presents the kinds and average amounts of contaminating matter which may be encountered in the same network.[4,5]

Distribution of the high-pressure pipe-line gas at marketing centers is accomplished at considerably reduced

TABLE 1—GAS-CLEANING EQUIPMENT USED IN A GAS-TRANSMISSION NETWORK

Location‡	Material removed	Type of equipment commonly employed
A	Liquid and solids	Gas-oil separator
B to F	Liquid	Knockout plus mist eliminator*
G to I	Liquid and solids	Oil bath plus mist eliminator*
J	Dust	Bag filter†

*Most commonly of the maze or centrifugally induced impingement type. †Cyclonic devices are frequently used. ‡Refer to Fig. 1.

pressure. The cleaning problems associated with the supply of low-pressure gas to the consumer, whether in the home, manufacturing plant, or business establishment, usually can be handled effectively by methods not applicable to high-pressure service.[3] For example, bag-type cleaners or filters are widely used which are effective in removing particulate matter of extremely small size.

Basic requirements . . . As applied to high-pressure pipe-line gas, a cleaner must remove both solid and liquid contaminants throughout a wide range of proportion. It must also act as a

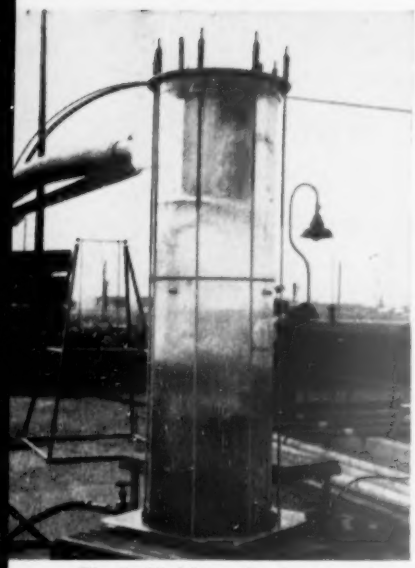

Fig. 6—Model permits visual examination.

Fig. 7—High-pressure sampling of scrubber oil.

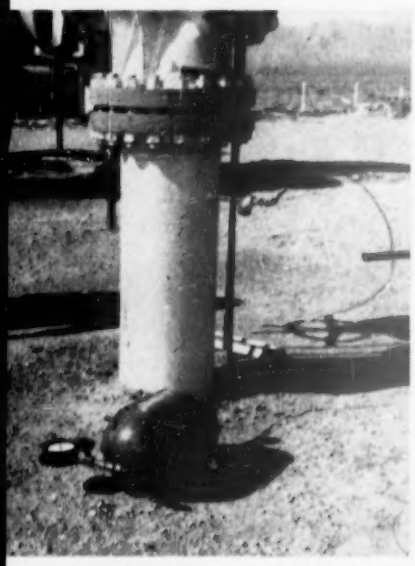

Fig. 8—High-pressure sampling of gas stream.

Fig. 9—Scrubber pressure-drop measurement.

protective device against large "slugs" of liquid. Such slugs may suddenly appear at the compressor suction because of an increase in gas-flow rate with subsequent sudden gas lifting of large quantities of liquid out of low points in the pipe line.

An instance is recalled where the presence of four large-sized scrubbers, having considerable reservoir capacity, saved a compressor station from the sudden arrival of such a large quantity of liquid. Since the pipe line was new and the gas free of dirt at the time, the scrubbers were being operated dry. This was a most fortunate circumstance because the amount of oil contained in the suddenly appearing slug was sufficient to fill all the units to capacity. If this dropout capacity had not been available, costly damage to the compressors would surely have resulted.

The typical scrubber . . . A typical scrubber for gas-pipe-line service, as employed to clean compressor suction-side gas, comprises three distinct sections. The first of these is an oil reservoir, where primarily occurs dropout of liquid, either as large gas-borne droplets or as a film flowing along the incoming pipe wall, and larger solid particles. Additionally, intermingling of the incoming gas occurs with the scrubbing oil in the reservoir. This mixing

TABLE 2—ORDER OF MAGNITUDE OF CONTAMINATION IN A GAS-TRANSMISSION NETWORK

	Entrained material in lbs. per M.M.s.c.f.	
Location†	Liquid*	Solid
A	Ext. variable	Ext. variable
B	Ext. variable	0.05
C	0.5	
D	8.0	
E	0.5	
F	10.0	
G	Trace	0.02
H	Trace	0.02
I	Trace	0.02
J		0.05

*Includes liquid flowing along pipe wall.
†Refer to Fig. 1.

Note: Details concerning average particle sizes of a wide variety of materials, the application of various methods of cleaning to particles in specific size ranges, and the pressure losses involved, may be had by reference to C. E. Miller's chart, a reproduction of which accompanies Reference 11. This chart was originally published in Chemical and Metallurgical Engineering, March 1938, p. 113.

or scrubbing does two things: (1) it wets and tends to absorb incoming liquid droplets and larger solid particles, and (2) it entrains a small amount of scrubber oil which can be gas lifted to the mist-detrainment section to form liquid films therein.

The second section comprises a relatively large space above the oil-bath section, where detrainment of the larger wetted particles can occur, either as a result of gravity or of centrifugal action which throws them outward against the vessel walls.

The third section is formed by a mist eliminator which collects fine liquid droplets by impaction against liquid films which have been formed on the mist eliminator surfaces by the gas-borne oil droplets, as described. These films act as adhering media whereby small solid particles still remaining in the gas stream may also be captured by impaction, to be subsequently washed off by the continuous refluxing of reservoir oil and returned to the bottom of the vessel. These functions are illustrated in Fig. 2.

Function of oil bath . . . The importance of using the gas stream for transporting reservoir oil for the purpose of forming liquid film on the mist-removing elements is not generally recognized. This is especially so with reference to the capture of fine dirt particles. Ample proof exists that wetting of fine particles cannot occur unless the scrubbing liquid is atomized to sizes having about the same magnitude as that of the particles themselves.[6] However, it is easily possible to form droplets small enough to be borne upwards by the

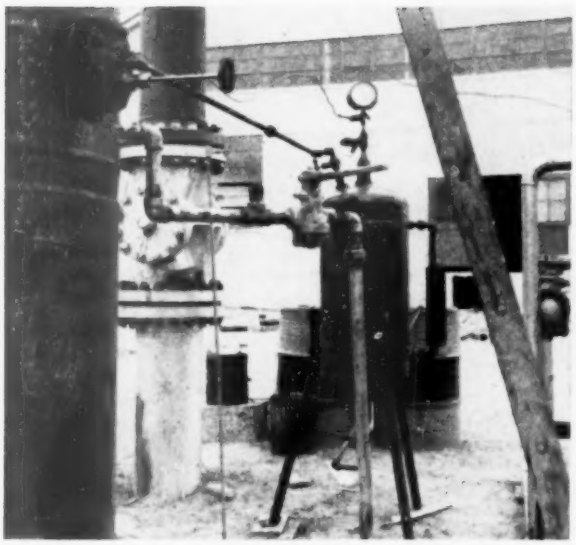

Fig. 10—Measurement of mist-eliminator detrainment rate.

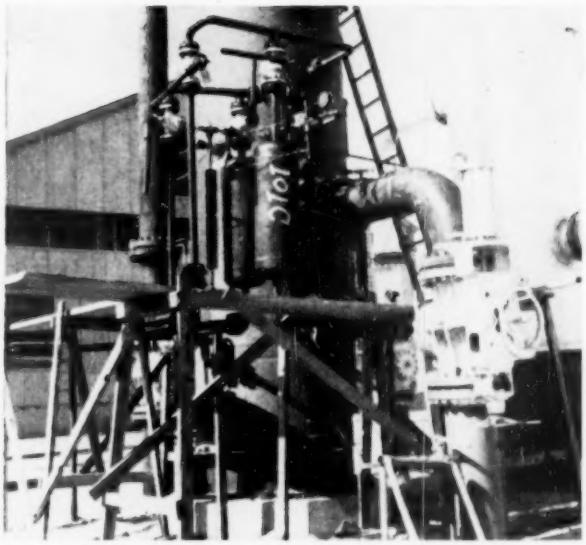

Fig. 11—Scrubber development under field conditions.

gas. By this means liquid films may be formed on the mist-eliminator surfaces, which can trap minute solid particles by centrifugally induced impingement.[7]

Subsequent addition of liquid droplets from the reservoir washes the detrained particles back to the bottom of the reservoir in the form of a sludge. It should be noted that, although a fine particle may happen to be wetted while passing through the reservoir section, the resulting density of the composite liquid-solid particle is such as to render it, in most cases, more susceptible to being lifted upward by the gas. The advantage of being wetted is that upon impingement with any portion of the scrubber internals, there is a high probability of adherence thereto, the particle thereby being effectively detrained.

Due to both availability and relative cheapness, the petroleum industry commonly uses hydrocarbon oils with which to charge its scrubbers. It is largely for this reason that more and more trouble may be experienced as operating pressures go ever higher, unless in scrubber design recognition be given to the effect of high pressure on the physical characteristics of the oil itself.

At high pressure some of the hydrocarbon gas will go into solution with the oil, the exact amount being a function of the equilibrium constants of all the hydrocarbons involved. This is analogous to putting carbon dioxide into solution with water, under pressure. Actual analysis of field samples has demonstrated that a 500 psi. scrubber oil may change density by as much as 5-10 per cent due to the absorption of pipe-line gas.

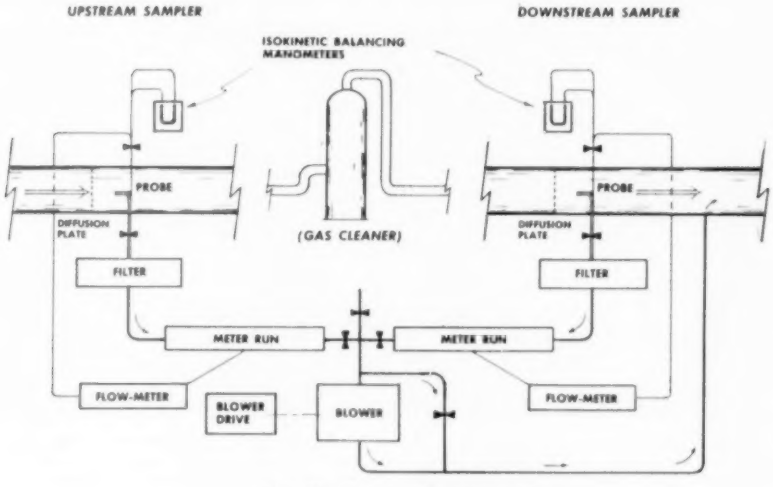

Fig. 12—Gas-sampling apparatus.

Calculations show that this would amount to approximately 20 per cent at 850 psi. The change in scrubber-oil density produced in this way is accompanied by alterations in both viscosity and surface tension. The general result of all these changes is to increase foaming tendency and the formation of extremely small-sized droplets. This makes it easier for the gas to carry reservoir oil upward to the mist-removal section in greater and perhaps overloading quantities. Under these conditions, the mist-removing elements may not be able to drain rapidly enough so as to prevent reentrainment of both liquid and dirt particles from the downstream side of the mist-removing section.

Additionally, oil droplets which are extremely small can pass through even the best mist filters without detrainment occurring at all. Therefore, the formation of extremely fine oil droplets should be avoided. It should be noted that a slight reduction of pressure on scrubber oil which is saturated by gas can cause the formation of fine droplets through effervescence, especially if turbulence is present. This phenomenon, something on the order of flash vaporization,[8] can produce a slow oil loss from the downstream side of mist-eliminator elements which are operated with an appreciable pressure drop.

Retrograde vaporization of scrubber oil is another serious consideration for hydrocarbon scrubbing oils operating at pressures greater than about 800 psi. As the pipe-line pressure reduces on downstream, this oil will condense out on the pipe wall. Unmistakable evidence of the occurrence of this phenomenon at 850 psi. has been observed

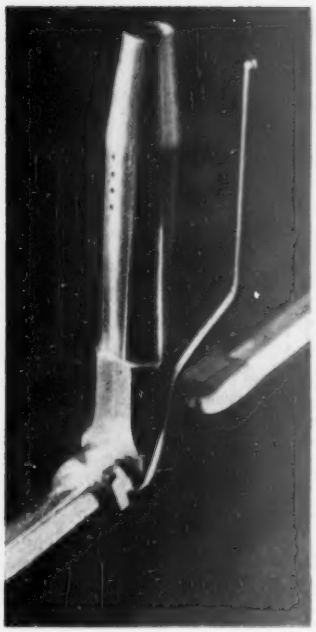

Fig. 13 — High-pressure gas-sampling probe.

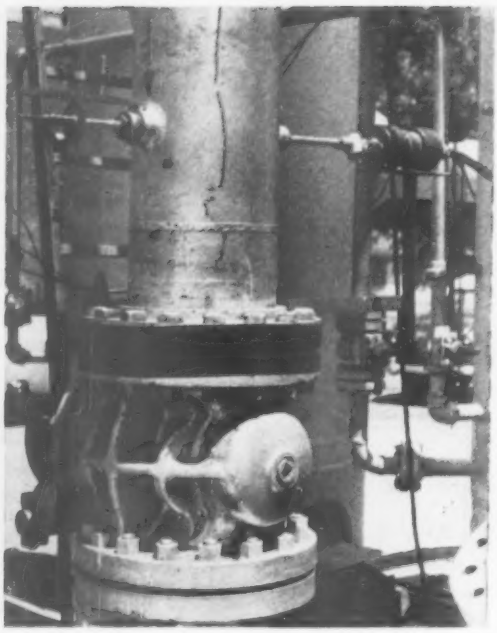

Fig. 14—Installation of high-pressure sampling probe downstream of scrubber.

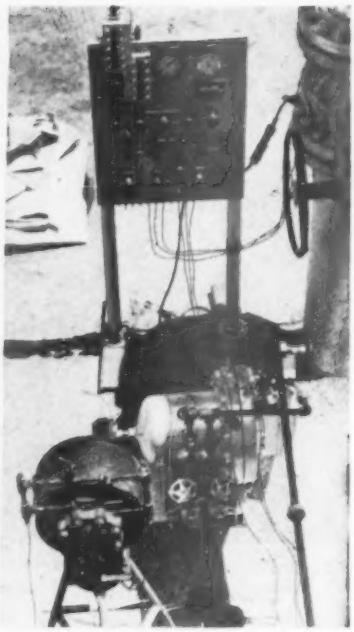

Fig. 15 — General view of gas-sampling equipment.

by the writer under field conditions.

For these reasons, it is quite apparent that at high pressure scrubber oil may deteriorate greatly to the point where, in effect, an entirely different liquid is present in the scrubber oil-bath, as compared to that initially introduced.

It would thus appear that more and more thought will have to be given to the use of nonhydrocarbon liquids for pressures in excess of 500 psi. or so. There are a number of nonhydrocarbon liquids which may be used for this purpose, such as low-vapor-pressure chemical plasticizers, but their cost and general nonavailability would appear to render their early acceptance by the petroleum industry improbable.

Operator requirements . . . It is obvious that the way in which a "modern" scrubber works is complicated, with regard to both fluid mechanics and the basic physics involved. From the equipment supplier's standpoint the real difficulty lies, of course, in the element of competition, with the operator wielding the whip. The latter naturally wants the most for his money in operating cost per cubic foot of gas cleaned, with the highest degree of cleaning possible, after lowest equipment installation and maintenance charges. He would much rather not have to "operate" his scrubbers but, like mufflers, install and then forget about them. And as with mufflers, he has frowned upon designs which involve moving parts.

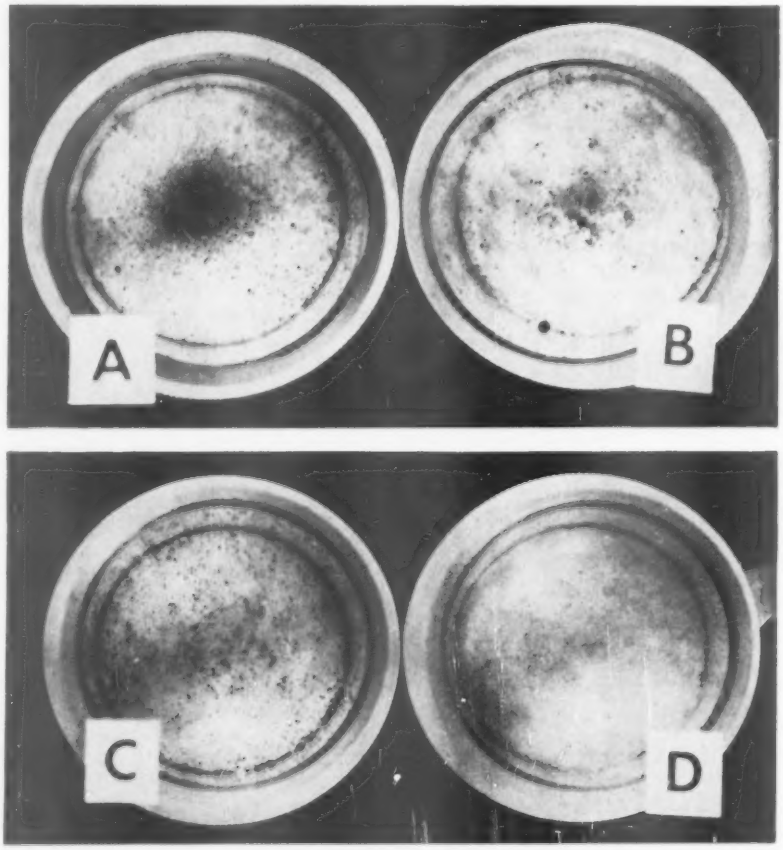

Fig. 16—Gas-contamination samples. (Upper) Dirt samples for same pipe location and length of run. Weight of "A" greater than "B" although throughput 18 per cent more for "B." (Lower) Simultaneously taken samples, "C" upstream and "D" downstream of scrubber, showing substantially complete dirt removal.

There is little doubt that enough is now known to make possible the cleaning of any gas to almost any desired purity. However, to compete successfully in the gas-cleaner market, the question is not "How can we clean it?" but instead, "How can we clean it the cheapest?" More thought needs to be given to determining the most economic degree of cleaning necessary for particular applications. Why go to great expense to remove the finest particles if the presence of such particles is not really detrimental to the basic operation? Research is, therefore, only the beginning. Competition requires a decided emphasis on the development phase of research and development.

The "Bones" of Gas Cleaning

The basic factors in gas cleaning (or in any physical-separation process) can be rather simply put in a form applicable to any specific gas-cleaning device. It must be remembered that what follows refers only to detrainment and has nothing to do with the possibility of reentrainment. Many workers in the gas-cleaning field believe that the major part of the cleaning problem is preventing reentrainment of particles once separated.

With reference to Fig. 3:

F is the force acting to move the particles out of the gas stream to a region of detrainment. The efficiency of a cleaner should be proportional to this force.

L represents the average distance that the particles need to move to reach the detrainment region. Efficiency should be inversely proportional to L.

The remaining factor T is residence time. Efficiency should be directly proportional to T, since this is the length of time that the separation force acts. (Assuming that the time required for particle terminal velocity to be reached is very small as compared to T.)

T = V/Q, the volume of the vessel, divided by flow rate.

All these factors can be combined as follows to form a coefficient C, which may be used to compare different classes of separation mechanisms:

$$C = \frac{F \times T}{L} = \frac{F \times V}{L \times Q} \qquad (1)$$

For example, a cyclonic separator[9] or electrostatic precipitator[10] produces a large separation force, acting only for a small period of time over a small separation length or distance. Accordingly, using symbol size to show the relative importance of these factors:

$$C_C = \frac{F \times T}{L} \qquad (2)$$

On the other hand a settling chamber[11] provides a small separation force acting for a long period of time and for a relatively large settling distance so that:

$$C_{SC} = \frac{F \times T}{L} \qquad (3)$$

In applying this hypothetical method of analysis to the oil-bath type scrubber, its three sections should be considered one at a time. In line with Equations 1, 2, and 3, the separation effectiveness for each section appears symbolically somewhat as follows:

(a) The oil bath: (Low-velocity short-period impingement)

$$C' = \frac{F \times T}{L} \qquad (4)$$

(b) The primary detrainment region: (Lower-velocity long-period settling and/or impingement)

$$C'' = \frac{F \times T}{L} \qquad (5)$$

(c) The mist eliminator: (High-velocity very short period centrifugally forced impingement)

$$C''' = \frac{F \times T}{L} \qquad (6)$$

This procedure provides a common frame of reference useful for expressing the characteristics of different separation schemes in a common simple language. Now, over these "bones" we must apply the specific boundary conditions, such as temperature, pressure, phase, (i.e., gas, liquid, or solid), particle size and shape,[12] density, gas characteristics, etc.

As a result, even though a specific separation means might initially appear to be the most attractive, consideration of these practical factors during development of a new cleaner design may show that a completely different method or combination of methods might be better from the customer's viewpoint. Thus, while purely centrifugal, electrostatic, or filtration methods can be effectively applied to the cleaning of pipe-line gas, the oil-bath scrubber, as now generally designed, seems to offer the most economical and effective compromise.

The oil-bath scrubber, through the use of a liquid as a wetting and detraining agent, is additionally very effective from the standpoint of reentrainment prevention.

Improvement of scrubber design . . . It wasn't too many years ago, when gas-cleaner design was more a function of expediency than basic scientific principles, that a little common sense and luck usually sufficed the manufacturer in supplying the market's need for such a product. The picture is quite different today. The change results largely from more stringent operating requirements coupled with the demand for more efficient cleaning.

Accordingly, unless a basically different approach is made to cleaning, the further improvement of the oil-bath scrubber will be made and more controlled by the law of diminishing returns. Thus, research and development are faced with two objectives. One is to improve, at increasing expense, existing designs; and the other is to invent more effective methods for gas cleaning based on fundamental scientific principles.

Research must be guided by experimental work in the field as well as in the laboratory because of the difficulty in dynamic scaling to full size, a gas-cleaner prototype which may be developed in the pilot plant. Very few laboratories have the facilities for conducting research at anything near full-scale unless the work is done at essentially atmospheric pressure.

Laboratory Tests

Fig. 4 shows a low-pressure laboratory setup for studying the fluid-flow characteristics and contaminant detrainment capabilities of mist eliminators. Solid and liquid particles are introduced at known rates in V2 and V4, respectively. Solid particles are entrained from a slowly revolving turntable in V2 and pass into the "conditioning" chamber V3 before entering the experimental mist eliminator. Contamination samples are obtained by means of the sampling equipment DS. Fig. 5 shows an experimental detrainment unit DU installed downstream of the droplet-forming nozzle. V5 contains pressurized spray oil.

Because of the complexity of three-dimensional fluid flow, visual observation of such phenomena is always useful in assaying the results of configurative changes in gas-cleaner internals. A large lucite model of a scrubber built for this purpose is shown in Fig. 6. Gas channeling in the central drop-out section can readily be inferred from the flow of oil film on the walls.

Field tests . . . The application of the scientific method to scrubber development requires that all boundary conditions influencing an experiment be carefully noted and their importance recognized. This requirement is usually much more difficult to satisfy in the field than in the laboratory. Figs. 7, 8, and 9 illustrate the acquisition of three of the most important of these boundary measurements under field

conditions. The first shows the drawing off under pressure, by a water-displacement method, an oil sample for later analysis. This is for the purpose of determining exactly what the scrubber-oil characteristics are under operating conditions.

Fig. 8 shows a gas sample being taken under pressure for pod-column analysis. Pressure drops across different portions of a scrubber are being taken in Fig. 9, the actual measurements being made by means of bellows-type differential-pressure indicators. These drop measurements are extremely important in evaluating some scrubber designs because oil "positioning" is a sensitive function of relative pressure drop.[13]

For studying the effect of pulsative gas flow on scrubber performance, instantaneous pressure drop can be measured using a strain-gage type differential-pressure transducer with its associated electronic equipment.[14] Pulsative flow is usually present in some degree because of the close proximity of reciprocating compressors and is capable of influencing cleaner operation through accoustical resonance phenomena.[15]

Fig. 10 illustrates a field experiment for the purpose of measuring the oil-return rate from the mist-eliminator section of a scrubber. For this test no alteration was made to the scrubber, except for the special hand-hole plate which served as the scrubber exit port for the returning oil and for the valve stem operating a gate valve in the mist-section downcomer. Measurements of mist section oil-detraining rates were made at 450 psi. by means of a gage glass on the high-pressure collection vessel. The collected oil was then forced back into the scrubber, using compressor discharge pressure to supply the necessary differential.

Under certain conditions, field research can take a more elaborate form as illustrated in Fig. 11. Here the scrubber was equipped with sufficient outlet ports during manufacture to make possible the measurement of oil detrainment rates at all key points, using the method described above. This particular test work was in connection with the development of a scrubber employing a venturi oil-aspirating arrangement for wetting solid particles and producing oil films on its mist-extraction elements. (See Fig. 2.)

New Gas Sampler

It is rather apparent, then, that the cost of effective gas-cleaner research comes high. It may also be noticed that none of the field testing described concerns the direct measurement of scrubber dirt or mist-removal efficiencies, with reference to pipe-line contamination. The acquiring and analysis of gas samples for the purpose of measuring such contamination, even at atmospheric pressure, is historically an extremely painstaking and difficult task.[16,17] Sampling at high pressure is rendered all the more difficult.

However, a recently developed tool makes it possible to secure accurate efficiency data in a matter of days, data which are unbiased by the human element. Such information greatly speeds field and laboratory research and helps to determine realistic and dependable sizing data for manufacturing. The schematic flow diagram of the apparatus is shown in Fig. 12. The key item in the design, resulting after an exhaustive literature search, is the sampling probe shown in Fig. 13.

The sample gas stream is drawn isokinetically,[18] as determined by two sets of static-pressure holes, one on the outer and one on the inner wall of the probe. The external set may be seen in Fig. 13, as can also the pitot tube for measuring dynamic head. The assembly is installed so as to allow for traversing the pipe, if necessary. Fig. 14 shows the traversing sampler in field use on the downstream side of a scrubber. In the same figure may also be seen the filter cartridge located as close downstream as possible to the probe.

The remainder of the equipment shown in the schematic flow diagram is illustrated in Fig. 15 with the upstream and downstream meter runs and flow meters appearing in the foreground.

Operation of sampler . . . The length of run necessary for obtaining a sample sufficiently large to permit analytical accuracy varies considerably, depending upon the degree of contamination present. It appears from preliminary tests, however, that on the average, a period of 6 hours will be satisfactory for this. In operation the contaminant is "caught" on filter pads, which are then weighed. A simple distillation makes it possible to determine the proportion of solid to liquid in the sample.

Use of this tool to date has been highly satisfactory. Samples like those shown in Fig. 16a-b clearly indicate that the degree of contamination especially in older pipe lines, can vary widely and rapidly, depending upon throughput. Fig. 16c-d shows samples taken simultaneously upstream and downstream of a gas scrubber. In this instance the dirt-removal efficiency obtained was substantially 100 per cent. It is anticipated that the sampling tool will pay for itself in a short time because of the acceleration in research and development rate now possible.

Gas-cleaner requirements . . . There is little question but that present high-pressure gas-cleaning requirements are keeping equipment manufacturers as a group in a highly competitive situation. The answer to competition appears to lie in both intensified research and bold imagination, both based upon experimental investigation of the actual problems involved. Gas-cleaning equipment which can actually handle the job and is economically priced will continue to have an everready and expanding market.

Future requirements will no doubt become more stringent, particularly for older pipe lines, as they are pushed to their pressure limits and tend to become more corroded. The trend is toward the use of more acid gas as time goes on, which, unless carefully treated, will result in increased dust contamination. The increased treating phase itself will require the installation of more liquid-removal equipment.

There will be more demand on the part of the customer that the supplier prove by means of scientifically acquired field data that his gas cleaner can really be expected to handle the job. As a possible outgrowth, may come some sort of standardized testing procedure on the part of manufacturers, similar to cooling tower evaluation methods. For this, some simple means using artificially introduced radioactively tagged contaminants can be employed, the contaminants having known physical characteristics such as size distribution, shape, and density.

Acknowledgment

The help and assistance given the writer by members of Fluor's research staff and other corporation personnel by reviewing the manuscript and offering constructive criticism is acknowledged.

Special recognition is given to Robert L. Solnick, who was largely responsible for the development of the gas-sampling apparatus described in this paper as well as the field test results presented.

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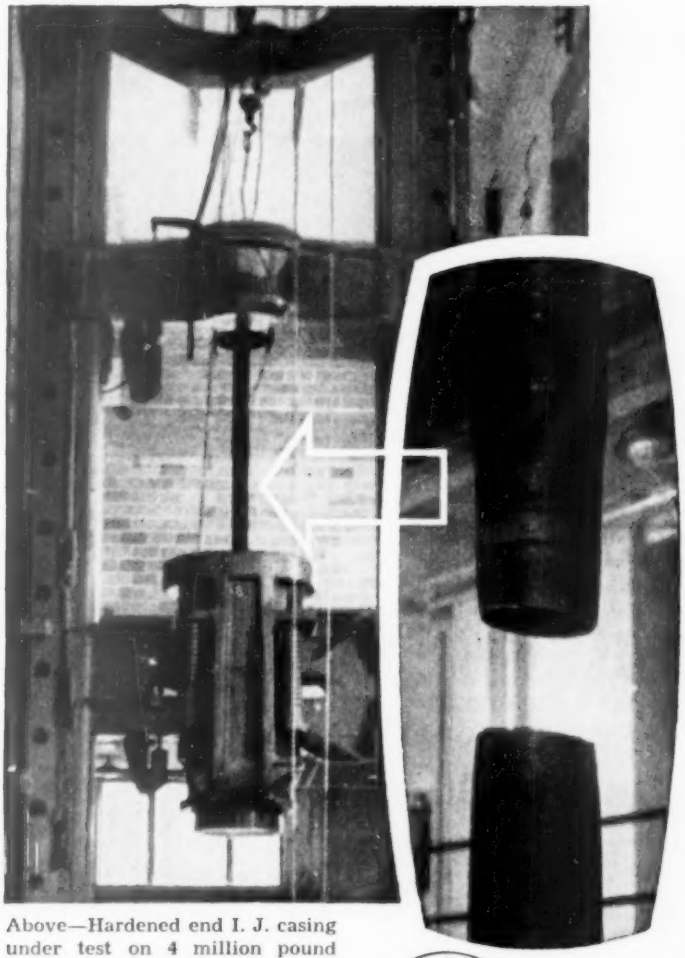
EXTRAS *that make it* BETTER



Above—Hardened end I. J. casing under test on 4 million pound testing machine at University of California. Closeup at right—Note that tested pipe broke in body, away from threaded connection.

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YOUNGSTOWN casing - Integral Joint and Threaded and Coupled - is produced with heat treated ends to meet the higher requirements of deep well drilling. The advantages are:

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B. of M. Reveals Analyses of Diesel Fuels

by O. C. Blade

THE use of diesel fuel in the United States continues to increase. The railroads were the largest consumers during 1951, using over 43 per cent of the total volume of such fuel, while trucks, tractors, buses, and other vehicles used 20 per cent, and the remainder was used by industry, utilities, and the military forces. At the present time over 14.3 million barrels of diesel fuel per month is produced in this country.

Need for more information on this type of engine fuel has resulted in annual surveys of diesel fuel by the Bureau of Mines, United States Department of the Interior, in cooperation with the American Petroleum Institute. The "National Annual Diesel-Fuel Survey, 1953," has recently been completed. Under the cooperative agreement, samples of diesel fuel were analyzed by the manufacturers using uniform methods of test, and the resulting data were sent to the Bureau of Mines for study and compilation. Tests were made by 47 companies on 278 samples of diesel fuel manufactured in 110 petroleum refineries throughout the country.

Author is petroleum chemist, Bureau of Mines, Bartlesville, Okla.

The results of the analyses are presented in tabular form in U.S.B.M. R.I. 5008 in four general groups according to classified limits established by the A.S.T.M. for three grades of diesel fuel. The groups are:

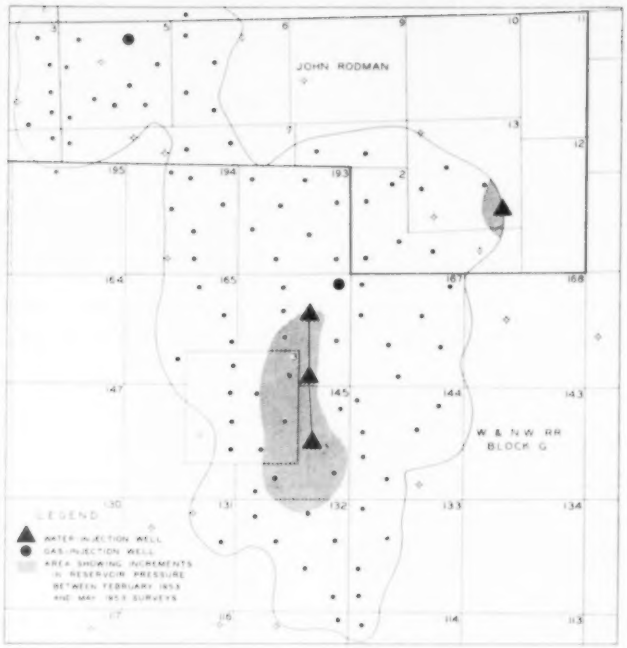
A.S.T.M. grade	Maximum dist. temp. (°F.)	Pour point (°F.)
1-D	End point, 625	
2-D (first section)	90% point, 675	Max., 0° F.
2-D (second section)	90% point, 675	Min., 5° F.
Fourth group	Fuels not conforming to the above and other limiting classifications.	

TABLE 1—SUMMARY OF GRADE 1-D FUELS

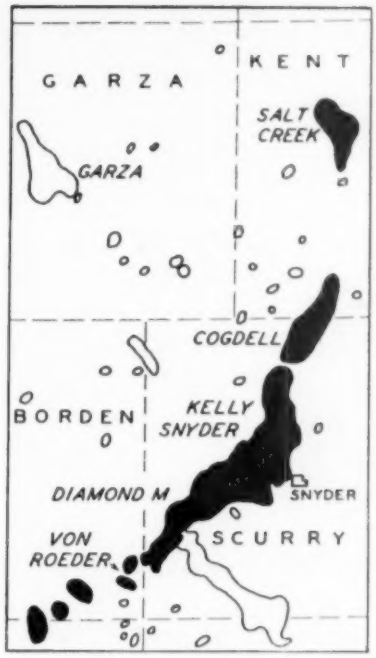
Geographic distribution of diesel fuels*—		Eastern region			Southern region			Central region			Rocky Mtn. region			Western region		
Districts within region		A,B,C			D			E,F,G			H,I,J,K			L,M,N		
Additional districts†		D,E,F,G,J			A,B,C,E,F,G,J			A,B,C,D,H,I,J,K,L			A,B,D,E,F,G,L,M,N			F,H,I,K		
Number of fuels		50			26			84			48			12		
Test—	A.S.T.M.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.
Gravity, °A.P.I.	D287	33.1	41.5	47.8	36.6	40.2	44.6	31.7	40.0	45.7	31.7	39.8	44.8	35.5	40.0	43.5
Flash point, P.-M. closed tester, °F.	D93	126		200	132		200	126		200	125		200	130		180
Color:																
A.S.T.M. Union colorimeter	D155	1		6	1		6	1		6	1		1½	1		2
Saybolt chromometer	D156	29		3	30		15	30		3	30		12	25		19
Viscosity at 100° F.:																
Kinematic, cs.	D445	1.41	2.07	3.07	<1.40	2.10	3.34	<1.40	2.23	3.34	1.40	2.15	3.12	1.59	1.99	2.81
S.U.s.	D88	30.7	32.9	36.2	30.0	33.0	37.1	30.0	33.4	37.1		33.1	36.4		32.6	35.4
Cloud test, °F.	D97	—64		10	—64		15	—60		15	—60		5	—58		—18
Pour point, °F.	D97	—65		0	—60		10	—60		10	—60		0	—60		<0
Sulfur content, per cent	D129	0.03	0.129	0.49	0.018	0.133	0.47	0.018	0.203	1.08	0.011	0.275	1.08	<0.02	0.308	0.90
Aniline point, °F.	D611	129	152.0	178	138.0	150.6	163	129	150.9	164.8	129	148.7	165	132	146.2	159.6
Ramsbottom carbon,‡ per cent	D524	0.00	0.072	0.17	0.004	0.069	0.12	0.00	0.059	0.14	0.00	0.052	0.14	0.04	0.083	0.14
Ash content, per cent	D482	0.000	0.001	<0.01	0.000	0.001	<0.01	0.000	0.001	0.03	0.000	0.000	<0.01	0.000	0.000	Trace
Cetane number	D613	43	52.5	65	46	51.7	59	41.0	51.8	59	41.0	50.2	57	42	49.2	63.8
Distillation test:§	D86															
I.b.p., °F.		322	360	418	330	361	420	329	367	434	323	367	426	323	362	400
10 per cent		352	400	510	365	407	466	352	414	510	356	410	466	376	404	433
50 per cent		403	454	546	409	463	530	402	469	546	402	463	526	410	453	517
90 per cent		458	519	583	464	527	580	456	535	588	456	529	588	466	514	588
E.p.		474	562	624	494	567	626	485	578	626	485	574	626	515	564	614

*Regions and districts are shown in report RI 5008, U. S. Bureau of Mines. †Some of the fuels are sold in districts of more than one region. ‡On 10 per cent residuum. §On volume recovered basis.

Note: All samples tested for corrosion by A.S.T.M. D130 were negative at 122° F. and with three exceptions in this survey were negative also at 212° F.



FIRST REEF EXAMPLE to employ center-to-edge full-section injection is Salt Creek field, Kent County, Texas. Cross-hachured area represents pressure gains due to water injection for period between February 1953 and May 1953. (Fig. 1.)



SALT CREEK FIELD lies at the northern extremity of a group of Canyon reefs (shown in black) extending throughout Kent, Scurry, Borden, and Howard counties, Texas. (Fig. 2.)

Center-to-Edge Line Drive Ups Recovery

Full-section injection along major axis of reef halts pressure decline

by Joseph A. Kornfeld
District Editor

SIGNIFICANT improvement in reservoir behavior is being accomplished through application of a center-to-edge drive flooding technique to Salt Creek field situated along the northern end of the 84-mile-long Scurry reef trend. This is the first case history of the application of this method to flooding of a reef structure in West Texas. (Figs. 1 and 2.)

Instead of employing conventional method of a line drive along edge of the field, General Crude Oil Co., operator of Salt Creek Unit, converted a line of wells situated along the major axis. The entire section of this Canyon reef is exposed to water injection. In this manner, oil is being displaced from the center of either flank of the reef buildup. This arrangement is shown in cross-sectional views in Figs. 3 to 8.

Advantages of water injection at Salt Creek include:

1. Reservoir pressure decline has been halted.

2. Excellent pressure communication is indicated from reservoir pressure surveys.

3. Reservoir behavior closely follows that predicted from potentiometric model experiments.

4. Neither bypassing nor channeling of water has occurred in the producing oil wells adjacent to the water input wells, even though more than 1 million barrels of water have been injected into the reef.

Development History

Reservoir mechanism operative at Salt Creek field is solution-gas drive. This reservoir contained neither an original gas cap nor an effective natural aquifer. This 6,300-ft. deep reef comprises one of the larger oil fields situated along the trend and has 98 oil wells producing a total of 9,200 bbl. of oil per day. Cumulative recovery from March 1950 (date of discovery) to August 1, 1953, is 7,843,129 bbl. of oil and 2,792,154 M.c.f. of gas.

The field has 77 unit flowing wells and 2 nonunit flowing wells, 19 unit pumping wells, 2 unit gas-injection wells, and 9 unit water-injection wells. Current water production is 1.7 per cent with 14 wells making water in measurable quantities.

Salt Creek Field

Total producing area of 8,765 surface acres has been developed on an average density of 80 acres per well, as compared to an average density of 40 acres per well for nearly all other Canyon reef fields situated elsewhere on this trend.

Productivity indexes at Salt Creek are of a high order of magnitude, averaging 8.97 bbl. per day per pound of pressure differential. These tests range from as low as 0.53 to 83.0 bbl. per day per pound.

Reservoir pressures, initially about 2,940 psi. in April 1950, had declined to an average of about 2,100 psi. during the month of May 1953, during

which period cumulative field recovery was about 7 million barrels of stock-tank oil. From June 1, 1953, to September 1, 1953, about 800,000 bbl. of oil was produced without a decline in average reservoir pressure.

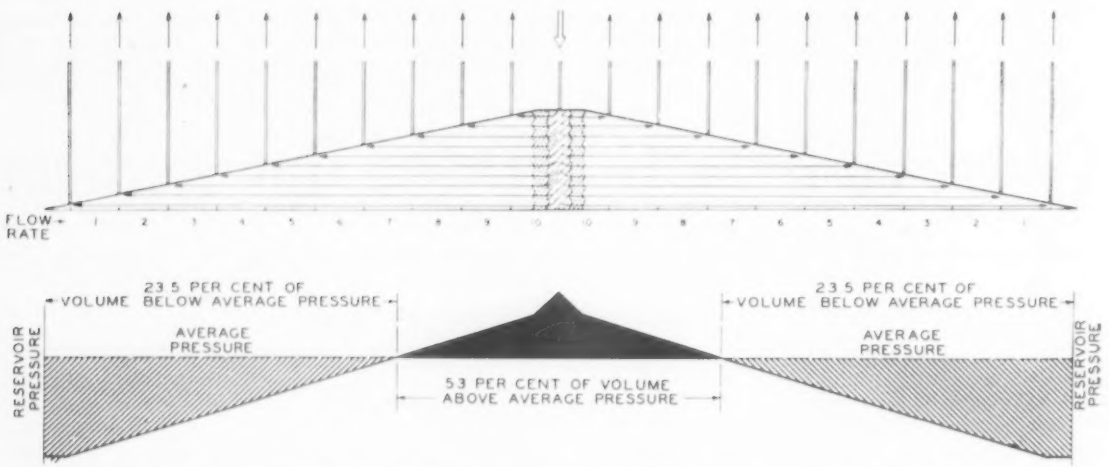
Canyon reef at Salt Creek is found at an average depth of 6,300 ft. or —4,200 ft. The reef exhibits an average thickness of approximately 190 ft. in Salt Creek field. Average subsea depth to the oil-water contact is 4,425 ft.

WATER-INJECTION OPERATIONS to maintain reservoir pressure are conducted in this Canyon reef reservoir at Diamond M field, Scurry County, Texas, one of the conservation projects in progress along the Scurry trend. Lion Oil Co. is in charge of this operation.

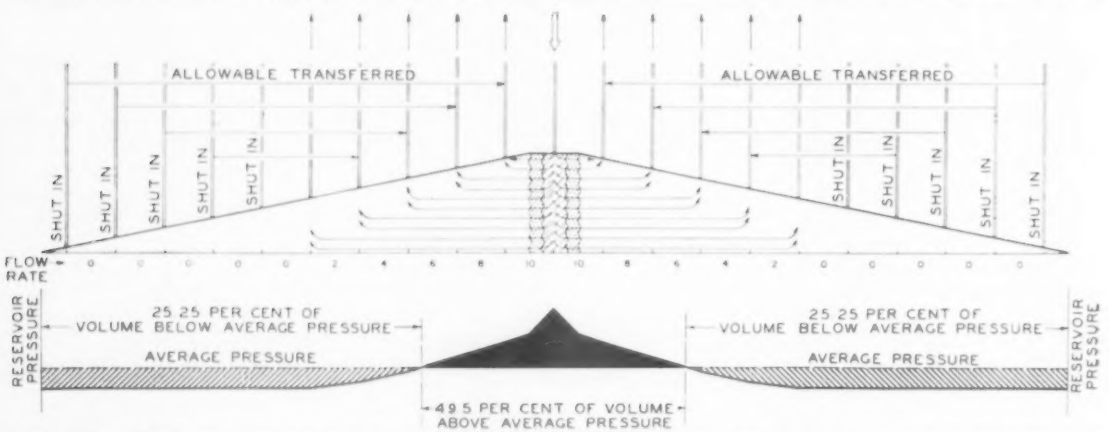
Core data . . . Reservoir data presented to the Texas Railroad Commission show that weighted average values from 655 ft. of cores of porous and permeable section show an average porosity of 9 per cent, an average permeability to air of 13.2 md., and an average permeability to oil of 10.5 md. Average total water content is 39 per cent and estimated connate water is 30 per cent. *(Continued on page 90.)*

The Center-to-Edge Flood Pattern . . .

How the plan works


FLOW RATE
23.5 PER CENT OF VOLUME BELOW AVERAGE PRESSURE
AVERAGE PRESSURE
RESERVOIR PRESSURE
53 PER CENT OF VOLUME ABOVE AVERAGE PRESSURE
23.5 PER CENT OF VOLUME BELOW AVERAGE PRESSURE
AVERAGE PRESSURE
RESERVOIR PRESSURE

LINE DRIVE FROM CENTER—A series of oil wells along the center of reef are converted to water-injection service after being deepened to oil-water contact. Flow rates are adjusted to formation thickness, assuring a uniform pressure gradient. (Fig. 3.)



EDGE WELLS SHUT IN—After injection starts, wells situated in concentric outer band of reservoir (below-average pressure area) are shut in. Allowable is transferred to producing wells in above-average pressure area higher on structure. (Fig. 4.)

MANY reef-type oil fields in the Permian basin do not have an effective water drive. Consequently, after severe pressure declines were experienced in a number of these fields along the Scurry reef trend in West Central Texas, operators commenced during the past few years to conduct water (and in some cases gas) injection in an effort to halt pressure decline and to improve recovery efficiency. One example, Salt Creek in Kent County, has been subjected to water injection since December 1952 with remarkable improvement in reservoir behavior, although some gains were partly due to gas injection carried on simultaneously.

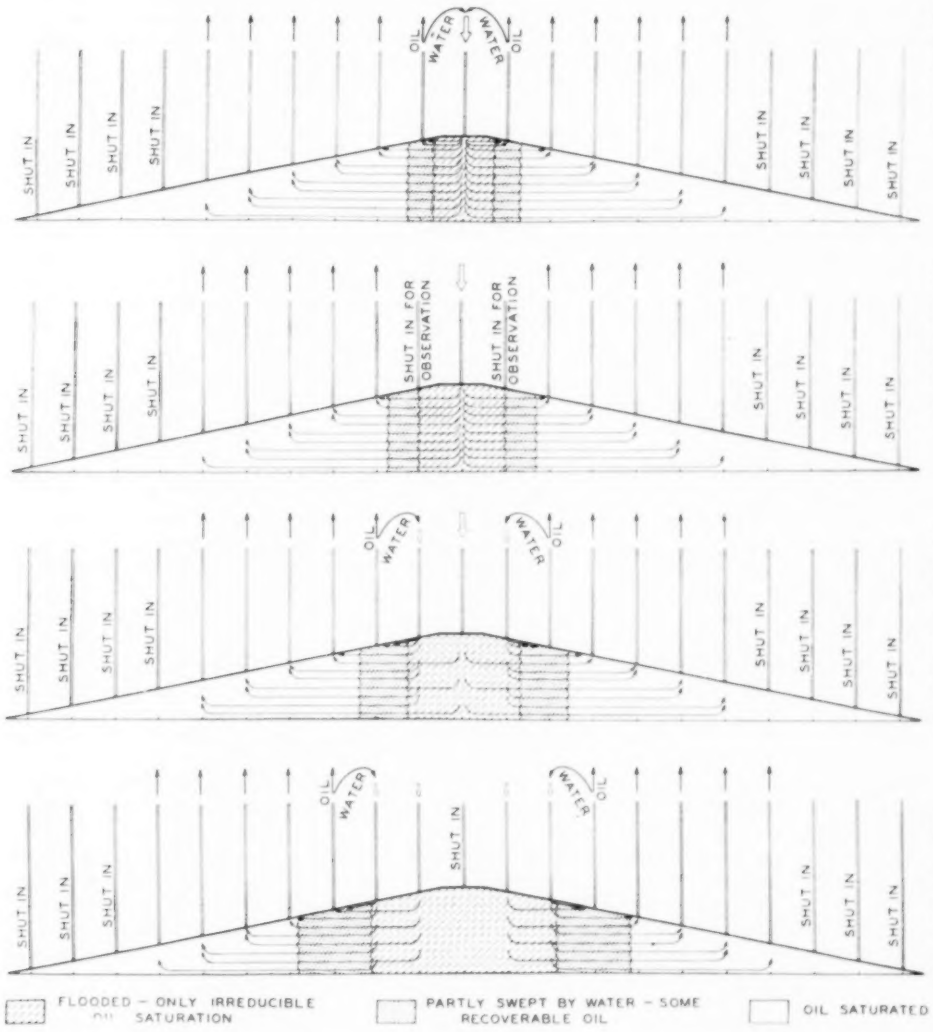
An injection technique "center-to-edge flood pattern"—described in this article, has been employed in a reef for the first time at Salt Creek. This article is prepared from performance and reservoir data submitted by the SACROC Unit to the Texas Railroad Commission. This principle has been employed in the Pettit limestone reservoir in the Haynesville field of North Louisiana and South Arkansas, and more recently in the Bacon limestone reservoir of New Hope field, Franklin County, East Texas. Salt Creek case history is believed to be the first example of this application to a West Texas reef. Its presentation is timely in view of the application pending before the Texas Railroad Commission by the SACROC Unit covering about 50,000 acres in the Kelly-Snyder and Diamond M fields in Scurry County, where engineers plan to employ the same technique for water injection into the Canyon reef. A series of six drawings showing the predicted progress of water injection and displacement of oil by this method from the SACROC reef appears with this article.

Advantages cited for the center-to-edge plan over the edge-to-center method include:

1. Center-to-edge plan avoids the problem of two flood fronts meeting in the center of the field.

2. Center-to-edge plan injects water into the high-pressure areas, displaces unshrunk oil from the center of the field outward. Under the edge-to-center plan, raising the pressure around the edges of the field (where pressures are low and the oil is shrunk) would not significantly improve fluidity of this oil.

3. Under the center-to-edge plan, which introduces water simultaneously into the entire vertical section of the reef, portions of the reef which are separated into essentially horizontal layers will receive benefit from injected water.



FIRST WATER BREAKTHROUGH—At this stage, the first water breakthrough occurs in the line of producing wells paralleling center line flood along major axis of reef. (Fig. 5.)

FIRST OIL WELL ROW WATERED OUT—First row of former oil wells adjacent to original line flood are now watered out. Situated on either side of the center line of reef, these wells are shut in for observation and to conserve pressure. (Fig. 6.)

NEW FLOOD ADVANCE. Area flooded out by water has advanced to position where wells in second line are now making appreciable quantities of water or are producing at high water-oil ratios. Wells formerly shut in for observation are now converted to water injection. (Fig. 7.)

ORIGINAL INJECTION WELLS SHUT IN—At this stage, wells in second line of former producing wells are converted to water injection. Original injection wells are now shut in. Flood now consists of five rows of wells in width with center row shut in. (Fig. 8.)

Reservoir oil properties . . . Table 1 lists values taken at bubble-point pressure of 1,294 psi. and at 0 psi.

TABLE 1—RESERVOIR OIL PROPERTIES, SALT CREEK OIL FIELD

Property—	Bubble-point pressure* (psi.)	Pressure (psi.)
Formation volume factor, bbl./bbl.	1.317	1.032
Viscosity of reservoir crude, cp.	0.79	2.44
Gas in solution at 122° F., cu. ft. per bbl.	516	0

*Crude is undersaturated; original reservoir pressure was 2,940 psi. at datum of —4,300 ft.

Average produced gravity of oil is 39° A.P.I., specific gravity of produced gas was 0.8 when separated at 185 psig. and 1.25 when separated at 0 psig. Salinity of produced water was 128,000 p.p.m. for total chlorides.

Water Production History

Water was first introduced into the field in December 1952 through three input wells situated along the major axis of the structure. In addition, a pilot injection well was placed in service on the extreme eastern edge of the field, by working over a formerly abandoned dry hole. This was General Crude Oil Co. 5 Percy Jones, SE SE Section 13, John Rodman Survey. By May 1953, total field injection rates reached 700 bbl. per day.

Marked increases in reservoir pressure were observed during the interval from February 1953 to May 1953 as shown by plotting incremental gains in reservoir pressure obtained from bottom-hole pressure bomb tests conducted in the field-wide pressure survey.

Area of improvement in reservoir pressure for this time interval extended around the injection wells for a north-south distance of about 9,500 ft. and up to 4,000 ft. in width (see Fig. 1). In addition, pressure increases were also observed near the pilot flood located on the eastern edge of the field. Meanwhile, average produced gas-oil ratios remained very low since the field was operating appreciably above the original saturation pressure.

Flood expanded . . . Encouraged by improvement in reservoir behavior, the first significant expansion of the crestal flood program came during May 1953 when three additional oil wells, located along the middle of the reef, were placed in water-injection service. Total field-injection rates increased from 700 bbl. per day to approximately 4,000 bbl. per day.

Continual improvement encouraged further expansion. During July and August 1953, four additional input wells were placed in operation and injection rates raised from 4,000 to 12,000 bbl. of water per day. Currently water-injection replacement amounts to about 84 per cent of the voidage caused by withdrawals of oil and gas from the reservoir. To date 1,003,942 bbl. of water has been returned to the reef. Gas-oil ratios averaged only 374 cu. ft. per bbl. during August 1953.

Since the average reservoir pressure is well above the saturation pressure, the reservoir should reflect field-wide adjustments in pressure due to water injection. This condition not only has proved true as shown by a series of field-wide pressure surveys but pressure buildup due to water injection has followed closely predictions based on a potentiometric model study.

Water and gas injection for the period from July 1, 1953, to September 1, 1953, exceeded oil and gas withdrawals by 45,165 reservoir barrels as shown by Table 2.

TABLE 2—VOIDAGE DATA—SALT CREEK FIELD
(Period from July 1, 1953 to September 1, 1953)

	Reservoir (bbl.)
Water injection	636,449
Casing-head gas injected	163,999
Total injection	800,448
Oil and gas produced	755,283
Net reservoir space voided	*+45,165

*Water and gas injection exceeded withdrawals by 45,165 reservoir barrels.

Pressure distribution . . . Analysis of isobaric contour maps prepared from key well surveys made in the fall of 1953 shows that these isobars parallel the direction of the line of water injection wells situated along the major axis of the Canyon reef at Salt Creek. These suggest that the water-injection project operates actually as a line drive with fluid moving outward from each side of the line of injection wells.

Gas injection . . . Pilot gas-injection operations at Salt Creek commenced on June 13, 1952, following unitization of the field in April of that year. By September 1, 1953, a total of 966,060 M.c.f. of gas had been injected into the reef.

One gas-injection well is located near the major axis of the field at General Crude Oil Co. 2 C. Hunt and J. W. Young, C NE NE Section 166, Block G, W&NWRR Survey; this is near the northern terminus of the early line-flood experiment. The other gas injection well is General Crude 2 Morgan Jones estate, C NW NE Section 5, John Rodman Survey.

Filtered Ocean Water Used to Flood Wells

(Continued from page 71)

can be isolated for flooding but often a section of 40 to 100 ft. still would be involved. Controlling the water front through such a thick section will be difficult. Little variation is shown in vertical permeability of individual sands but their horizontal permeability varies widely. This characteristic may make for extensive channeling and oil by-passing.

Another problem will be that many of the producers have been completed in several sands of a zone, and sometimes in two zones. Isolation of a sand for water injection will be difficult and expensive.

Still another limiting factor will be the wide diversity of ownership and operators. Extensive faulting, as shown in Figs. 1 and 2, will facilitate confining injection operations to a single fault block. Even so, unitization would be required before injection could be attempted in Fault Blocks 1, 2, and 3.

Because of the large participation of the city of Long Beach in Blocks 4, 5, and 6, water injection more likely will be undertaken in these areas if the trial project proves successful. Limited floods could be undertaken by the city's operators in south-flank zones in these blocks. Unitization of city properties with those of other operators would be required before extensive work could be started on the north flank.

Fault Block 4 . . . As is shown in Table 1 the city controls about 45 per cent of the production and wells in Block 4. Characteristics of the Tar, Ranger, and Terminal zones in this block are given in Table 2.

These pools are bounded on the west by the west-dipping Power Line fault. It completely traverses the Wilmington anticline and forms an effective pressure barrier between Block 3 and Block 4 pools.

The east-dipping Harbor Entrance-Allied fault system bounds Block 4 on the east. Because of the en echelon arrangement of the faults, pressure migration is possible between Block 4 and Block 5 pools. The pressure opening is in a structurally high position, however. Thus, for purposes of limited water injection, Block 4 pools can be treated as separate units.

Preliminary studies conducted by J. F. Dodge, Los Angeles consultant, and by Harbor Department engineers indicate water injection can be successfully carried out in the three upper zones. This is particularly true in the Ranger and Terminal zones, where the

crudes are less viscous and have higher gravities.

Insofar as the city's wells are concerned, no remedial work would be required on Tar and Ranger producers as all producers are single-zone completions. Terminal producers offer a much greater problem. A large percentage are completed in both the upper and lower Terminal. Even where single-zone wells exist considerable remedial work would be required. In most cases they are open to production from all or some combination of the six upper Terminal sands or from all or some of the lower Terminal sands.

Because of the extensive unitization necessary, it is believed water injection will not be attempted in Block 4 for some time; probably not until its feasibility has been proved by full-scale projects in Blocks 5 and 6.

Blocks 5 and 6 . . . Should the initial project prove water injection feasible, further investigations probably will be next carried out in Blocks 5 and 6 pools. The city's participation in these blocks is much larger and little unitization would be required. As shown in Table 1, the city controls approximately 90 per cent of the oil production in this area.

The eastern boundary of the Block 5 pools is formed by the west-dipping Golden Avenue and Daisy Avenue faults. These are en echelon and it is thought probable the corridor between these faults provides a path of pressure equalization in the three upper zones. East limit of Block 6 has not been determined but it is expected that it also will be established by faulting. As is shown in Table 3, characteristics of the Tar, Ranger, and Terminal sands in Block 5 are similar to those of Block 4.

Insofar as the Tar and Ranger zones are concerned, any water injection in the near future would have to be confined to the north flank. This is because development has not been carried sufficiently far south to establish the oil-water contact. Unitization would be required before any north-flank project could be started.

For these reasons any programs started in the near future probably will be confined to upper and lower Terminal pools. Here again, unitization will be required before extensive work can be undertaken on the north flank. Locations of input wells for carrying out a water-injection program on the south flank, recommended by Dodge in this report to the Harbor Department, are shown in Fig. 3. All six would be open to the HX and J-X sands, five would be open to the K-Z-W-A, and two would be able to inject water into the AA subzone of the lower Terminal.

From this brief discussion it is readily evident the city of Long Beach would have to unitize its properties with offset operators before full-scale floods can be undertaken. Under the city's existing charter it is believed doubtful this can be done. It is proposed therefore that an amendment which will permit unitization will be submitted to the voters of Long Beach at a special election.

Small Refinery, But Big Products List

(Continued from page 75)

mal cracking, although redistillation might be practical in the future to make one or more clean cuts for the chemical market.

4—SMALL REFINERY BUT MANY PRODUCTS

Referring back to Fig. 1, note that the No. 2 crude unit at the Cosden plant operates on sweet crude, the charge at present averaging about 5,000 bbl. daily of Wilshire Ellenburger and Spraberry Ellenburger crude oil. The No. 2 crude unit consists of two fractionating columns and a stripper. The two fractionators are interconnected for stacked operation with a total of 37 trays making an undercut straightrun gasoline overhead, four side cuts, and topped-crude bottoms.

Catalytic cracking . . . The U.O.P. fluid catalytic cracking unit now operates at a total capacity of 10,000 bbl. daily made up of 9,000 bbl. per day of fresh feed and 1,000 bbl. per day of recycle. Operation is at a conversion level of 60-62 per cent as measured by gas-oil disappearance. The cat cracker went on stream in the fall of 1949 at a design capacity of 6,000 bbl. daily of fresh feed at 50 per cent conversion. Revamp which included increase in blower capacity and exchanger and cooler surface in the gas-concentration section as well as changes in debutanizer bottom tray design have aided in obtaining increase to present capacity.

The cat cracker gas-concentration section includes a primary absorber using cat cracker fractionator gasoline as absorption medium and a sponge absorber employing light cycle oil for absorption, so that absorption can be adjusted to hold down loss of C_3's. The C_3-C_4 stream from the debutanizer goes to a U.O.P. multibed single-reactor poly unit.

Other petrochemicals . . . The cat cracker light cycle oil is a highly aromatic material which goes principally to the Dubbs unit along with heavy cycle and clarified slurry to make cracked residual particularly suitable as charge for oil-black manufacture. For other operations a secondary flash tower, comprising part of the Dubbs facilities, is frequently used.

A small chemical plant at the Cosden refinery produces pure aryl mercaptans from Unisol extract and recovers phenols and cresylic acids from spent caustic.

An HF alkylation unit is under construction with capacity of 2,100 bbl. per day of light aviation alkylate. This unit will operate on C_4's, C_4's and C_5's and will replace the present cat poly operation. Existing poly equipment, including the amine treater, caustic treater, depropanizer and deethanizer, will be incorporated into the alkylation unit. Finished grade 115/145 aviation gasoline will be manufactured.

Water treating . . . Cosden is also expanding utilities by way of increases in steam-generating capacity, cooling-tower capacity, and new water-treating facilities. Of high interest is the fact that Cosden utilizes treated effluent from the city of Big Spring sewage-disposal plant for boiler feed water and cooling-tower makeup services. Water conservation is particularly important in West Texas. Wells adjacent to the refinery are wholly inadequate to provide the requirement of over a million gallons of water daily. Total cost of utilizing treated sewage effluent is presently 18 to 22 cents per thousand gallons.

Acknowledgment

Appreciation is expressed to D. M. Krausse, assistant to the president, and A. R. Orr, process engineer, of Cosden Petroleum Corp., for their aid in obtaining data for this article.

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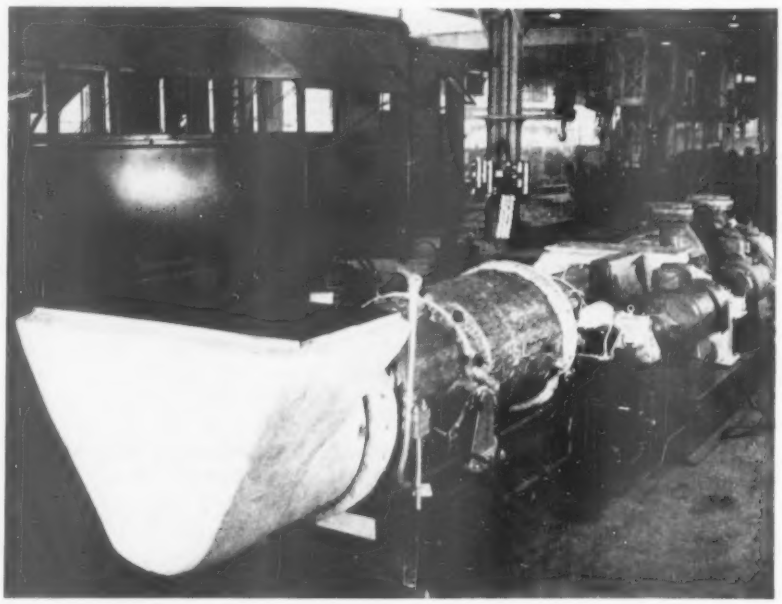
Trailer-mounted gas turbine being tested

THE 1,800-lb. gas turbine-compressor shown in photo will be installed in the trailer in background, and is now being tested by the U. S. Army Corps of Engineers to determine its suitability for supplying compressed air.

The plant requires only two external connections for starting—electric power for ignition and motor-driven auxiliaries, and distillate fuel for the gas turbine. Once started, only the fuel connection is needed, as the 60-kw. generator supplies the auxiliary motors.

The simple open cycle gas turbine is reported to develop more power per unit of weight and volume than any other type of prime mover, and is thus ideally suited for this mobile unit. Westinghouse supplied the 8,750-r.p.m. gas turbine, and Clark Brothers the compressors. The plant was installed by Dresser-Stacey Co., Cincinnati.



Pipe-pushing bars

have roller tips

TO move pipe to the rack quickly and safely, a roller-tipped pushing bar is used. This apparatus has a pipe handle of the desired length and size having a convenient crossbar handle welded to one end. The opposite end is tipped with two pieces of channel iron formed at a 90° angle where it is welded to the end of the push bar. Retainers are attached to each end of the angle iron, near the outer end, to attach wheels from roller skates. When two men unload tubing, for example, they set the push bars against the joint and give a shove. The forked end containing the roller wheels automatically center and the job is completed. For larger pipe, casing and the like, similar push bars are made but having longer and heavier angles so that they will center over the pipe without slipping.

One tractor uses its winch to pull while the other pushes the 150-ton rig for Rowan Drilling Co. of Fort Worth on drilling location for Amerada Petroleum Corp.

Tractors move rigs without dismantling

IN Tioga oil field in North Dakota drilling rigs are moved from one location to another without disassembling. Mendenhall Construction Co., of Ray, N. D., keeps a crew on the job 20 hours a day skidding the 150 to 225-ton derricks to new drilling sites.

The complex job of moving the heavy rigs requires specialized equipment. Mendenhall, in handling the

At this Tioga field, North Dakota, drilling site a tractor winch is used to ease the heavy drilling rig over to the prepared location.

moving jobs for 23 rigs, has found the most efficient equipment to be the winch-equipped crawler tractor. He has 11 tractors in use. He is using one tractor-winch combination to take care of the heavy pulling jobs.

The preparation work and rig skidding have been set up on a mass production basis. While the smaller tractors level the new location, the large tractors move in to dig pits and clear roads over which the drilling rig can be pulled. The winch line on the large tractor is used to pull the rigs. On the level one tractor can handle the job, on hills two tractors are needed, one pulling or holding back with the winch.

Hills, mud, sand, snow, and frozen ground pose periodic problems where the versatility and power of the winch prove invaluable. When terrain conditions cause the tractor to lose traction, the operator moves ahead to get a sure footing on solid ground and, remaining stationary, winches the drilling rig up to the tractor, then moves ahead a few hundred feet and repeats the operation. When traction is good the winch brake is set and the tractor moves ahead without stopping. In this manner the rigs are moved usually a distance of 2 or 3 miles and some have been moved up to 8 miles.

The Tioga oil field is a 180-sq.-mile area opened to drilling in 1950, although full-time drilling didn't start until the fall of 1951.

Spare flow meter reduces down time

AVAILABILITY of a spare flow meter and standardized piping can keep down time at a minimum in production work.

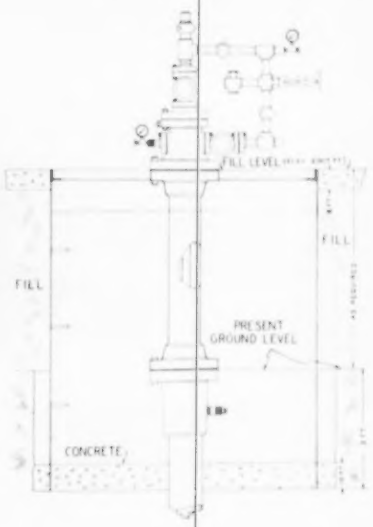
This is illustrated by Plymouth Oil Co. in some of its Sinton field, South Texas, leases.

Piping layout for flow meters is standardized on some of the Plymouth Oil Co. leases to make installation of a spare meter, when necessary, an easy job.

Flow meters have been installed at a lease battery to take fluid tests to determine water content of oil produced from various wells.

The decision was made to standardize the piping layout involving each of the flow meters, so that with one spare always kept on hand, it would be a simple matter to replace by merely breaking couplings and substituting the spare flow meter when necessary. The damaged meter could then be repaired while normal operations continued.

The replacement can not only be done in a few minutes, but this method additionally insures that the test unit would not have to be shut down for an undetermined length of time until repairs could be made or a new meter obtained.



Caisson is used to raise christmas tree

A CAISSON is employed to permit elevation of the christmas tree by Sunray Oil Corp. in Fort Chadbourne field, Texas. This is used to solve a problem brought about by inundation of the area to create a water reservoir for the nearby city of Sweetwater.

Additional value of this installation is that after the well is depleted field workers can have easy access to the well head for the purpose of removing fittings and casing.

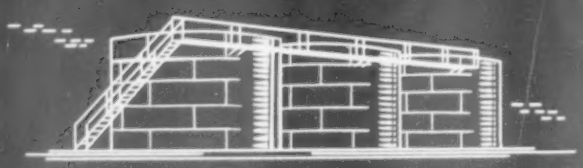
Caisson installation . . . The plan shown in the figure was employed in completing Sunray wells Nos. 2 and 4 Harris Davenport. A 5-ft.-diameter well caisson was erected permanently over each well head before an earthen mound was built. Workers have access within the caisson when it is nec-

Inundation problem . . . Creation of a reservoir for the city of Sweetwater caused the need for an increase of from 6 to 25 ft. in the ground level at well location. For the 2 Harris Davenport, an 8-ft. extension was employed over the well head to permit the christmas-tree flange center to extend to the spillway water level of 2,004 ft.; a mound level of 2,007 ft. was employed.

In the case of 4 Harris Davenport, Caisson was so designed and sufficient extension was made to the surface casing to elevate the well head 22 ft. to a spillway elevation of 2,004 ft.; a mound level of 2,007 ft. was used.

FOR DEPENDABLE PUMPING SERVICE

CHOOSE NORRIS RODS



NORRIS TYPE 30
CARBON MANGANESE SUCKER ROD
For heavy pumping duty, mildly corrosive crude

NORRIS TYPE 35
NICKEL CHROMIUM MOLYBDENUM ALLOY SUCKER ROD
For medium to heavy pumping duty, medium corrosive crude

NORRIS TYPE 40
NICKEL MOLYBDENUM ALLOY SUCKER ROD
For heavy pumping duty, medium corrosive crude

NORRIS TYPE 50
HIGH NICKEL MOLYBDENUM STEEL SUCKER ROD
For heavy pumping duty, severely corrosive crude

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1. Electronic Gating Knockmeter . . .

for combustion studies in full-scale engines

by M. M. Adams

A new instrument has been designed to overcome limitations in engine testing common to other instruments of this general classification. The Electronic Gating Knockmeter performs an important function in that it permits the operator to correlate signals with crankshaft angles, a feature which is not available on any of the instruments now on the market. In addition to routine automotive test work, several other suggested uses for phase sensitive instrumentation of this type are described.

MANY electronic instruments, which are capable of giving accurate qualitative and quantitative information regarding combustion and detonation in engines, have been developed over the past several years. However, limitations exist as to the types of engine with which these instruments can be successfully used, with the transducer which can be employed, with the number of cylinders of the engine, and with the r.p.m. of the engine. One most important limitation which the aforementioned instruments have in common is an inability to allow the operator to determine the crankshaft angle at which an event of interest is occurring.

The Electronic Gating Knockmeter has been designed with the objective of overcoming the limitations inherent in those instruments already available for use in detonation studies. Fig. 1 shows the pilot model of this instrument. Fig. 2 is a schematic wiring diagram. The degree of flexibility incorporated in the design of the instrument permits studies in time interval and phase measurements, as well as amplitudes of the signals of interest. The input signal can be derived from transducers as widely different as an internal-type velocity pickup, an external-type velocity pickup, a catenary-type pressure pickup, an ordinary crystal microphone, and an ionization gap.

Signals which are not of interest are effectively commutated out of observation and measurement through use of a pedestal or "gate" upon which is superimposed the signal which the operator wishes to observe. This gate can be varied from approximately 0.0002 to 0.020 seconds time length and can be made to occur at any desired phase with respect to engine crankshaft angle through the use of a control on the front panel. This fact permits an operator to select, observe, and measure the amplitude of detonation or combustion in any particular cylinder of a multicylinder engine without interference from other cylinders or from extraneous noises normally associated with full-scale engine operation.

A builtin calibration circuit furnishes a convenient and rapid means of measuring the time width of the gated interval so that a correlation of the distance in engine degrees between occurrences of certain signals can be made.

Author is manager of instruments division, Phillips Petroleum Co., Bartlesville, Okla.

Operation of Instrument

The Electronic Gating Knockmeter can be conveniently divided into three channels for operational analysis. The channels are the synchronization channel, the signal and calibration channel, and the integrating channel. A brief description of the functioning of each channel is outlined by reference to Fig. 2 which appears on the next page and Fig. 3 which will be presented in a later installment.

Synchronization Channel

A magnetic-type pickup is mounted adjacent to the flywheel or some rotating member of the engine-dynamometer assembly. A small iron stud is tapped into the rotating assembly so that during each revolution of the engine the stud moves in close proximity to the magnetic pickup, including a voltage pulse in the pickup coil. This pulse is utilized for sychronization of the knockmeter with engine rotation and is transmitted through a cable to the "Sync. Input" jack. The signal is amplified through a three-stage variable gain, resistance-couple amplifier, composed of the second section of V-5 and both sections of V-1. V-2 is an Eccles-Jordan binary circuit, the function of which is to divide the synchronization pulses by a factor of 2. The input signal from Plate 2 of V-1 is a negative pulse with a minimum value of approximately 25 volts; this pulse cuts off the conducting section of V-2 which in turn drives the nonconducting section into operation. The next pulse arriving from V-1 returns the binary stage to its original mode of operation.

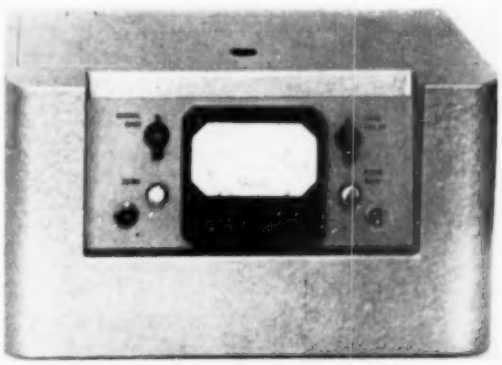
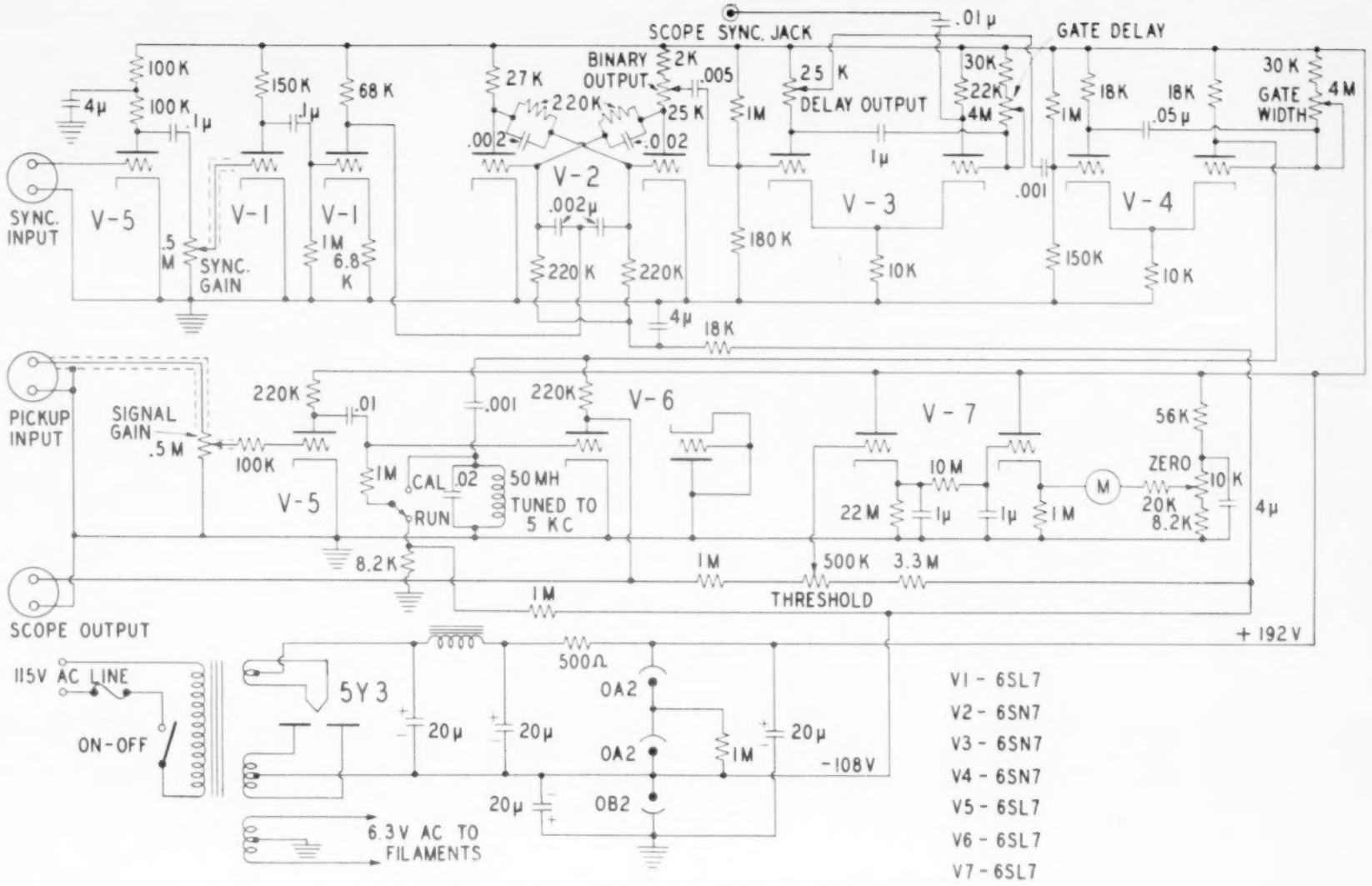


Fig. 1—Pilot model Electronic Gating Knockmeter.



V1 - 6SL7
V2 - 6SN7
V3 - 6SN7
V4 - 6SN7
V5 - 6SL7
V6 - 6SL7
V7 - 6SL7

Fig. 2—Schematic wiring diagram of Electronic Gating Knockmeter.

How to Design and Evaluate Absorbers—8

by R. J. Hull and K. Raymond

Example design calculations . . . Although absorber design method outlined in preceding installments is capable of excellent accuracy, it has the admitted appearance of being cumbersome to use. Actually, only 3-4 hours' time is required for a complete solution. This time compares quite favorably with other less precise methods, considering that a complete heat and material balance automatically derives from this method but not from the other simplified methods. In order to illustrate the absorber design procedure a sample calculation is presented below. The example illustrates the procedure for absorbers in the 40-900-psig. range. Calculation steps for absorbers in the 1,400-2,100-psig. range are outlined following the example.

I. DESIGN PROCEDURE IN 40-900-PSIG. RANGE

BASIC DESIGN INFORMATION

A. Intake gas:
1. Rate—37,000 M.c.f. per day (V_{1G})
2. Temperature—75° F. (T_{1G})
3. Composition—volume per cent

Carbon dioxide	0.50
Methane	83.78
Ethane	7.84
Propane	4.99
Isobutane	0.68
n-Butane	1.14
Pentanes plus	1.07
Total	100.00

B. Lean oil:
1. Rate—200 g.p.m.
2. Temperature—80° F. (T_{1O})
3. Gravity—36.8° A.P.I.
4. Molecular weight—210
5. Vapor pressure (presence of light hydrocarbons)—neglect

C. Column pressure—620 psig.

D. Number of actual trays—20.

E. Ambient temperature—70° F. (T_{AMB})

CALCULATION STEPS

A. M. lb. per day lean oil

$$= \frac{\text{g.p.m.} \times \text{lb. per gal.} \times \text{min. per day}}{1{,}000}$$

$$= \frac{200 \times 7.001 \times 1{,}440}{1{,}000} = 2{,}016$$

B. Intake gas:

	V_{1G} Vol. %	M.c.f./day	Lb./M.M.c.f.	M. lb./day
CO_2	0.50	185	116.2	22
C_1	83.78	30,998	42.4	1,314
C_2	7.84	2,901	79.4	230
C_3	4.99	1,846	116.4	215
iC_4	0.68	252	153.5	39
nC_4	1.14	422	153.5	65
C_5+	1.07	396	*210.0	83
	100.00	37,000		1,968

*Estimated.

C. Weight ratio lean oil per intake gas

$$= 2{,}016/1{,}968 = 1.02$$

First trial average column temperature from Fig. 5:

$T_{AV} - T_{1O} = 30°$ F.; $T_{1O} = 80°$ F.; $\therefore T_{AV} = 110°$ F.

D. M.c.f. per day lean oil

$$= \frac{\text{M lb./day} \times 378.6}{\text{Mol. wt.}} = \frac{2{,}016 \times 378.6}{210}$$

$$= 3{,}635$$

E. Try intake gas shrinkage, S = 3,200 M.c.f. per day

F. First trial $(L/V)_{BTM} = (L_o + S)/V_{1G}$

$$= \frac{3{,}635 + 3{,}200}{37{,}000} = 0.185$$

G. Compute first trial shrinkage using theoretical trays = actual trays × 0.33 = 6.6. See calculation tabulations on Table I to be given in a later installment. Calculated shrinkage is close enough to proceed with more detailed calculations.

H. Now, $V_{DG} = 37{,}000 - S = 37{,}000 - 3{,}004 = 33{,}996$ M.c.f. per day

Compute mole fractions of components absorbed in top section, and from these mole fractions, compute top section total heat of absorption.

	$y_{1G} \times (V_{1G}/V_{DG}) \times (1-F)/K_{DG}$			x_1	L_1x_1	M. lb./day	B.t.u./lb.	M. B.t.u./day
CO_2	(0.0050)	(37,000/33,996)	(1 − 0.063)/2.95	= 0.0017	8	1	69	69
C_1	(0.8378)	(1.0884)	(1 − 0.0292)/6.34	= 0.1396	706	30	65	1,950
C_2	(0.0784)	(1.0884)	(1 − 0.140)/1.32	= 0.0556	281	22	144	3,168
C_3	(0.0499)	(1.0884)	(1 − 0.386)/0.48	= 0.0695	351	41	138	5,658
iC_4	(0.0068)	(1.0884)	(1 − 0.765)/0.232	= 0.0075	38	6	132	792
nC_4	(0.0114)	(1.0884)	(1 − 0.900)/0.171	= 0.0072	36	6	132	792
				$\Sigma x_1 = 0.2811$				12,429

$$L_1 = \frac{L_o}{1 - \Sigma x_1} = \frac{3{,}635}{0.7189} = 5{,}056$$

I. Top section heat of absorption per pound of lean oil = 12,429/2,016 = 6.2 From Fig. 3, $T_{DG} - T_{1O} = 14°$ F., $T_{1O} = 80°$ F., $T_{DG} = 94°$ F.

J. Compute T_{EO} by over-all heat and material balance:

$$(M.W.)_{DG} = \frac{\text{M. lb./day} \times \text{cu. ft./lb. mole}}{\text{M.c.f./day}}$$

$$= \frac{(1{,}968 - 325)\ 378.6}{37{,}000 - 3{,}004} = 18.3$$

Specific heat of discharge gas = 0.590 from Fig. 2.

Assume 6-ft.-diameter column with 2-ft. tray spacing, then approximate column area = 3.14 × 6 × 20 × 2 = 754 sq. ft.

$$W_{LO}\,Cp_{LO}\,(T_{EO} - T_{1O}) + W_{DG}\,Cp_{DG}\,(T_{DG} - T_{1G}) + W_R\,Cp_R\,(T_{EO} - T_{1G}) = \Delta H_v - 0.024UA\,(T_{AV} - T_{AMB})$$

$$(2{,}016)\ (0.50)\ (T_{EO} - 80) + (1{,}643)\ (0.590)\ (94 - 75) + (325)\ (0.65)\ (T_{EO} - 75) = 40{,}426 - (0.024)\ (3.0)\ (754)\ (110 - 70)$$

$$1{,}008\,(T_{EO} - 80) + 18{,}411 + 211\,(T_{EO} - 75) = 40{,}426 - 2{,}160$$

$$1{,}008\,T_{EO} - 80{,}640 + 18{,}418 + 211\,T_{EO} - 15{,}825 = 40{,}426 - 2{,}160$$

$$1{,}219\,T_{EO} = 116{,}313$$

$$T_{EO} = 95°\text{ F.}$$

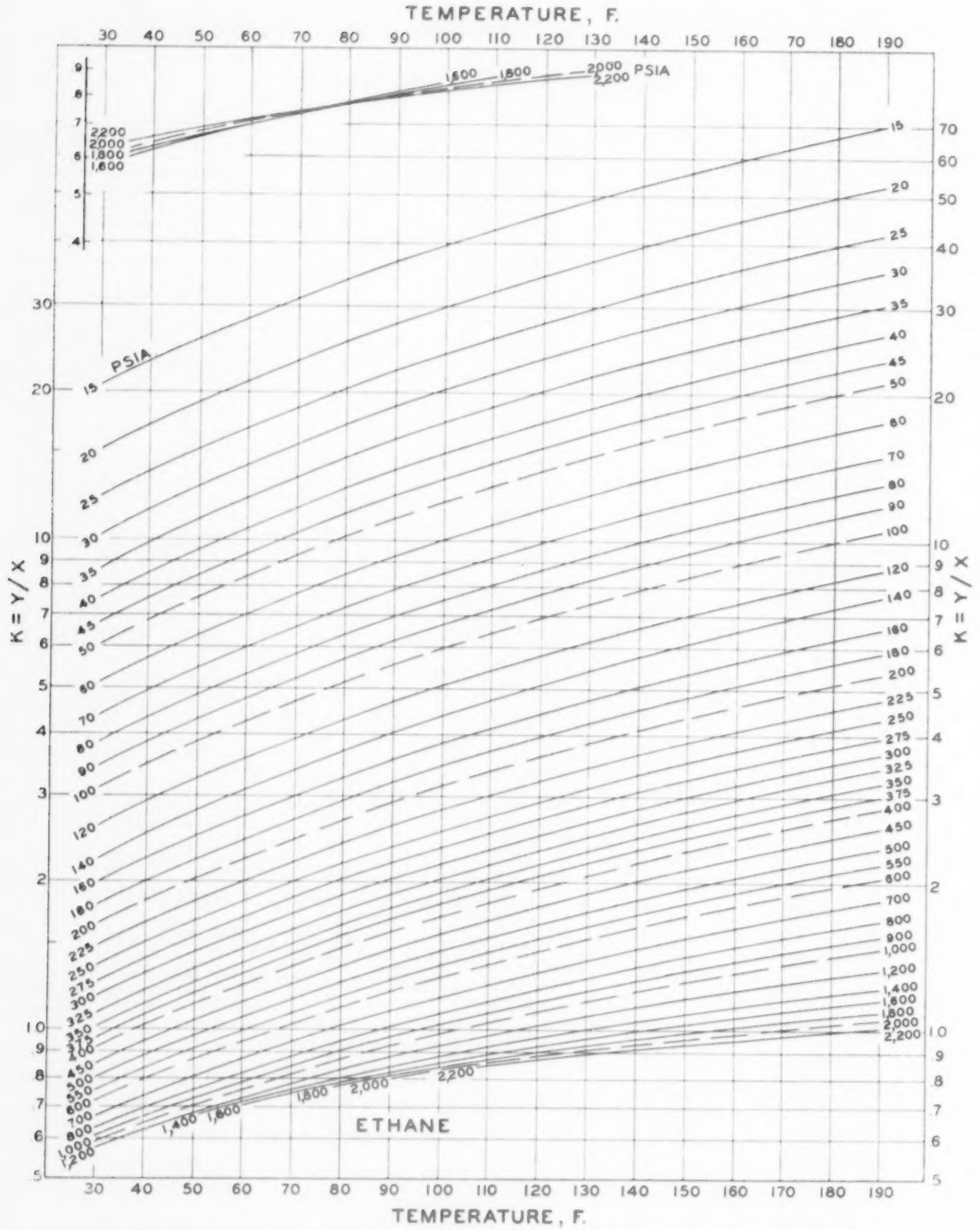
(Continued on next page)

*California Research Corp., La Habra, Calif. Paper presented at California Natural Gasoline Association meeting, Los Angeles, October 8-9, 1953.

Field Processing (Continued)

$$K_{\text{ave}} = \frac{T_{LO} + T_{HO}}{2} = \frac{80 + 95}{2} = 88^\circ \text{ F.}$$

Ethane . . . Katz and Hachmuth (Ind. Eng. Chem. 29, p. 1072, 1937) values are used. Ethane K values are affected somewhat by phase compositions and, for this reason, calculated ethane yields may be slightly in error for some systems. However, this is not considered to be too important in that ordinarily ethane is not now a commercially important key component.



Equilibrium constants for ethane in absorption oil (Reference: Ind. Eng. Chem. 29, p. 1072, 1937).

by W. L. Nelson
Technical Editor

COST-imating

Costs Stabilizing or Declining

SINCE about June 1952, labor costs and material costs have been rising (or falling) at about the same rate indicating a stabilization of construction costs at about the present level. Obviously, however, an increase in wages could further increase construction costs, or a decline in material prices could restrain further increases or even cause a slight decline in construction prices. No such balance between the cost of material and the cost of labor has existed since about 1944.

The cost indexes shown on this page may be used to bring the prices of the Cost-imating Series (October 21, 1948, through December 29, 1949) to current prices. Similar itemized cost indexes are published quarterly in the first weekly issues of January, April, July, and October. In addition, the Nelson Refinery Construction Index appears in the first weekly issue each month on the Refining page of The Oil and Gas Journal.

Itemized Cost Indexes

(Multiply the 1946 prices of the Cost-imating Series by these Index Numbers divided by 100)

	1948	1949	1950	1951	1952	Sept 1953	References*	Index for earlier years (The Oil and Gas Journal unless noted) in Cost-imating issues
Labor:								
Skilled construction	125.0	133.9	140.0	148.3	157.9	170.8	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	131.0	140.4	148.1	156.8	168.2	186.0	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	128.0	137.1	144.0	152.5	163.1	178.4		No. 61—Dec. 15, 1949
Refinery operation	126.0	132.9	137.6	149.1	155.1	167.3	Sur. of Current Business	No. 55—Nov. 3, 1949
Equipment or materials:*								
Boilers, tanks and sheet metal	†140.0	†134.8	†136.0	†156.1	†153.4	†150.9	Code 10-72	April 21, 1952‡
Boiler tubes, 2-2¼ in.	†135.0	140.9	149.5	163.3	168.8	200.8	Code 10-14-61	
Building materials (nonmetallic)	147.1	151.2	154.8	164.3	164.4	174.6	Code‡ 13	No. 22—Mar. 17, 1949
Brick—building	122.8	127.7	132.5	141.2	140.6	144.1	Code 13-41	No. 20—Mar. 3, 1949
Brick—fireclay	133.3	139.8	153.4	165.3	167.1	190.2	Code 13-42	
Castings (foundry products)	144.6	150.5	152.9	167.2	168.0	180.6	Code 10-15	No. 46—Sept. 1, 1949
Clay products (structural, etc.)	121.3	126.0	134.6	145.2	145.8	157.7	Code 13-4	No. 20—Mar. 3, 1949
Concrete—ingredients	119.4	123.7	125.3	132.7	132.7	140.1	Code 13-2	No. 22—Mar. 17, 1949
Concrete—products	118.9	121.7	124.4	132.8	132.6	138.4	Code 13-3	
Electrical machinery	127.6	130.9	134.9	154.3	152.4	159.9	Code‡ 11-7	See Marshall-S. (below)
Electrical motors and generators	128.6	128.7	135.0	155.8	154.6	159.0	Code‡ 11-73	No. 31—May 19, 1949
Electrical transformers, etc.	127.0	129.7	131.6	147.7	148.0	161.9	Code‡ 11-74	No. 31—May 19, 1949
Engines (composite)	116.9	124.8	126.0	146.1	146.5	150.2	Code‡ 11-54	No. 36—June 23, 1949
Exchangers	130.0	133.0	140.0	152.0	165.8	179.8	Manufacturer	No. 2—Oct. 28, 1948
Fans and blowers	131.3	152.2	162.9	190.1	183.7	188.4	Code 11-47	Feb. 17, 1949‡
Hand tools	125.2	134.0	143.2	154.2	155.1	169.7	Code 10-42	
Instruments (composite	120.0	123.1	127.8	142.3	146.2	156.3	Manufacturer	No. 34—June 9, 1949
Flow meter (mechanical)		109.2	114.0	126.8	132.3	160.5	Manufacturer	No. 34—June 9, 1949
Flow meter (air control)		132.4	138.5	157.6	160.5	178.8	Manufacturer	No. 34—June 9, 1949
Flow meter (remote)		130.2	135.5	151.7	155.2	146.0	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point		125.8	134.0	146.6	151.5	161.5	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control		131.6	134.1	136.8	144.9	162.0	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder		130.2	135.6	153.3	158.4	166.3	Manufacturer	No. 34—June 9, 1949
Pressure gage		100.0	101.2	108.6	108.6	108.6	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)		118.6	124.0	144.3	149.4	153.2	Manufacturer	No. 34—June 9, 1949
Control Valve		129.8	133.3	155.5	155.5	169.5	Manufacturer	No. 34—June 9, 1949
Insulation materials	126.8	123.6	125.0	128.8	130.4	133.2	Code 13-72	
Lumber (composite)	181.0	165.3	193.0	208.5	203.2	199.5	Code 8-1	No. 7—Dec. 2, 1948
Lumber (Southern Pine)	174.3	157.7	176.9	189.1	191.2	188.3	Code 8-12	No. 7—Dec. 2, 1948
Lumber (other soft woods)	206.5	203.9	230.2	252.7	248.5	256.6	Code 8-13	
Machinery—general purposes	124.9	131.9	136.7	153.0	151.8	158.3	Code 11-4	Feb. 17, 1949‡
Machinery—construction	127.8	136.0	140.1	155.3	157.5	164.4	Code 11-2	
Machinery—oil field	†125.9	†132.9	†135.8	†149.6	†149.9	†161.4	Code 11-51	
Paint and paint materials	143.0	141.2	136.9	153.9	151.9	151.7	Code 6-2	No. 22—Mar. 17, 1949
Paints—prepared	141.4	142.8	140.0	153.8	155.7	156.5	Code 6-21	
Pipe, sewer	†119.1	†119.3	†129.9	†147.1	†146.6	†153.2	Code 13-45	No. 22—Mar. 17, 1949
Pumps, air compressors, etc.	127.0	135.9	138.2	155.9	155.6	166.8	Code‡ 11-41	No. 20—May 5, 1949
Steel (iron and steel)	141.1	143.3	152.9	166.7	168.5	181.8	Code 10-1	No. 61—Dec. 15, 1949
Steel—finished steel	160.4	173.8	182.6	196.9	201.2	224.2	Code 10-14	
Steel—plate and sheet		(See boilers, tanks, etc., above)						
Valves and fittings	†125.9	†132.9	†135.8	....	†226.0	†235.1	Code‡ 11-49	No. 46—Sept. 1, 1949
Marshall-Stevens equipment (only) indexes:								
Process industries (average)	131.5	131.5	135.8	144.9	145.1	146.5	Chem. Eng. June 1953	Chem. Eng. Feb. 1951
Chemical	130.0	130.0	133.8	142.5	142.8	144.1	Chem. Eng. June 1953	Chem. Eng. Feb. 1951
Petroleum	132.0	132.0	136.5	145.6	146.0	147.5	Chem. Eng. June 1953	Chem. Eng. Feb. 1951
Electrical power	135.0	135.0	139.3	148.3	148.7	150.2	Chem. Eng. June 1953	Chem. Eng. Feb. 1951
Refrigeration	141.0	139.9	147.3	159.2	159.7	161.4	Chem. Eng. June 1953	Chem. Eng. Feb. 1951
Steam power	132.0	132.0	136.6	146.5	147.0	148.5	Chem. Eng. June 1953	Chem. Eng. Feb. 1951
Nelson Refinery Construction	132.5	139.6	146.2	157.2	163.6	177.6		No. 61—Dec. 15, 1949

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices." †Estimated base value for 1946. ‡Not exactly the same items as those published before July 7, 1952. §Questions on Technology, The Oil and Gas Journal.

Alphabetical List of Some of the More Common Refinery Alloys and Steels

(A similar listing, alphabetized according to service or equipment will be published later)

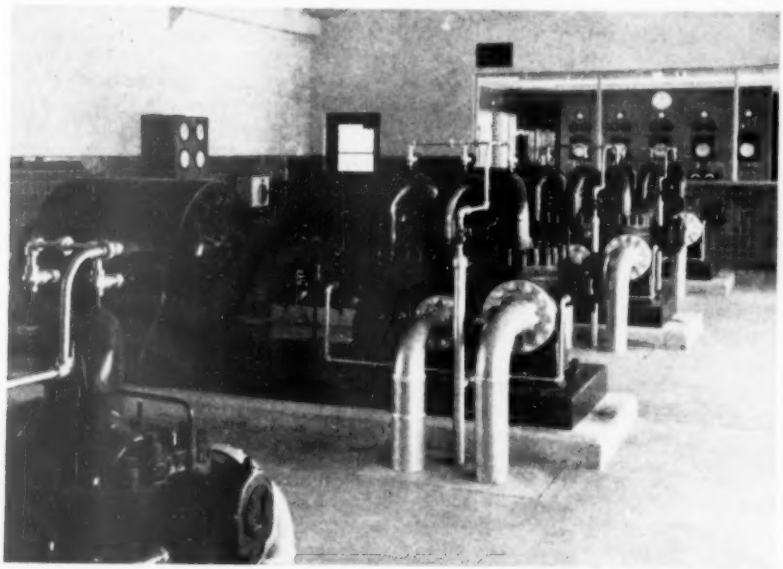
by W. L. Nelson
Technical Editor

Part 5

Material—	Outstanding service	Chemical composition, per cent* C	Cr	Ni	Mn	Si	Others
Steel, low temperature:							
Standard nickel steels (see steels, low alloy, S.A.E. 2110, 2320, 2512, etc., down to minus 50° F.)							
Stainless steels (high nickel) (see steels, stainless, Types 304, 310, 316, 321, etc., down to minus 450° F.)							
Nickel alloys (see monels, inconel, and pure nickel, down to minus 400° F.)							
Nickel chromium steel	Bolting	0.4	1.0	1.5	0.85		0.2 Mo
Nickel casting	Down to minus 75° F.	0.12		1.03	0.65		
Nickel casting	Down to minus 100° F.	0.14		2.02	0.65		
Nickel casting	Down to minus 150° F.	0.13		3.5	0.65		
Nickel casting	Down to minus 175° F.	0.05		4.0	0.65		
Nickel casting	Down to minus 175° F.	0.08	0.3	4.05			0.16 Va
A.I.S.I. 2800	Down to minus 350° F.	0.10		8.6	0.77		
13 per cent nickel	Down to minus 400° F.			13.0			
Manganese chromium steel	Down to minus 450° F.	0.11	9.9		17.7		
25-24 chromium nickel	Down to minus 450° F.	0.24	25.0	24.4			
36 nickel iron	Down to minus 450° F.	0.04		36.0			
40 nickel iron	Down to minus 425° F.			40.0			
Steel, pipe	(See steels, low alloy)						
Steel, plate	(See steels, low alloy)						
Steel, return bends	(See steels, low alloy)						
Steel, stainless:							
501 (4-6 Cr)	Sulfide resistance	0.1	4.0-6.0		1.0	1.0	
502 (4-6 Cr)	Sulfide resistance	0.1	4.0-6.0		1.0	1.0	
405 Al (available as clad plate)	Sulfide and scaling resistance	0.08	11.5-13.5		1.0	1.0	0.1-0.3 Al
410 (available as clad plate)	Sulfide and scaling resistance	0.15	11.5-13.5		1.0	1.0	
302 (18-8)	Sulfide, acid, and scaling resistance	0.08-0.2	17.0-19.0	8.0-10.0	2.0	1.0	
304 (available as clad plate)	Sulfide, acid, and scaling resistance	0.08	18.0-20.0	8.0-11.0	2.0	1.0	
304 ELC (available as clad plate)	Sulfide, acid, and scaling resistance	(Same but only 0.03 carbon)					
309 (25-12)	Sulfide, acid, and scaling resistance	0.2	22.0-24.0	12.0-15.0	2.0	1.0	
310 (25-20)	Sulfide, acid, and scaling resistance	0.25	24.0-26.0	19.0-22.0	2.0	1.5	
316 (available as clad plate)	Same and naphthenic acids	0.1	16.0-18.0	10.0-14.0	2.0	1.0	2.0-3.0 Mo
316 ELC	Same and naphthenic acids	(Same but only 0.03 carbon)					
317 (18-8 Mo)	Same and naphthenic acids	0.1	18.0-20.0	11.0-14.0	2.0	1.0	3.0-4.0 Mo
321 Ti (18-8)	Same and high temperature stability	0.08	17.0-19.0	8.0-11.0	2.0	1.0	(†)
347 Cb (available as clad plate)	Same and high temperature stability	0.08	17.0-19.0	9.0-12.0	2.0	1.0	(‡)
430 (available as clad plate)	Scaling and sulfide resistance	0.12	14.0-18.0		1.0	1.0	
Steel, structural	(See steels, low alloy)						
Steel, tubes	(See steels, furnace)						
Tantalum metal	(Boiling hydrochloric acid)						
Tantiron	(See Duriron)						
Tube steels	(See steels, furnace)						
Worthite	Cold dilute hydrochloric acid and brines	0.07	20.0	24.0	0.6	3.3	(§)

*A blank does not necessarily mean zero or absent—it may mean that information is not available. The meanings of the symbols are **Fe**, iron; **C**, carbon; **Cr**, chromium; **Ni**, nickel; **Mo**, molybdenum; **Mn**, manganese; **Cu**, copper; **Zn**, zinc; **Sn**, tin; **Al**, aluminum; **Mg**, magnesium; **W**, tungsten; **Si**, silicon; **Sb**, antimony; **Va**, vanadium; **Ti**, titanium; **Pb**, lead; **Ag**, silver; and **Cb**, columbium. †Minimum per cent titanium = 5 times per cent carbon. ‡Minimum per cent columbium = 10 times per cent carbon. §Rest Fe, 3.0 Mo, 1.7 Cu.

Pipe-Line Patrol



ONLY PUMP STATION presently operating on the Pioneer Pipe Line is this one, located at Sinclair, Wyo. The station is electrically driven, with four explosionproof motors driving three 400-hp. pumps and one 200-hp. unit.

PIONEER PRODUCTS LINE

Unusual Pressure-Control Methods Feature Steeply Dropping Artery

by Gerald L. Farrar
Engineering Editor

THE Pioneer products pipe line, completed in the latter part of 1953, provides an additional outlet for refined products from the Rocky Mountain region. Connections are made at Salt Lake City, terminus of the line, to the Pacific Northwest area.

The line drops several thousand feet over the last few miles of its route, thus necessitating unusual pressure control arrangements. Two regulators are installed in parallel at Salt Lake City, one to control pressure during line operation and one to maintain desired back pressure when the line is shut in. Switchover from one regulator to the other is accomplished manually by station personnel.

Line route . . . The 290-mile, 8-in. line is jointly owned, 65 per cent by Continental Oil Co. and 35 per cent by Sinclair Pipe Line Co. It originates at Sinclair's refinery at Sinclair, Wyo., and proceeds in a westerly direction in the general neighborhood of the route of the Lincoln Highway and the Union Pacific Railroad by way of Rock Springs, Green River, and Evanston to North Salt Lake City (see accompanying route map).

Near Salt Lake City the new pipe line connects with the Salt Lake Pipe Line Co.'s system, through which it delivers products to the Snake and Boise River valley areas in Idaho and eastern Oregon and in the Columbia River Basin of the Pacific Northwest at Pasco, Wash. Terminal outlets in the Snake and Boise River valleys are located at Burley and Boise, Idaho.

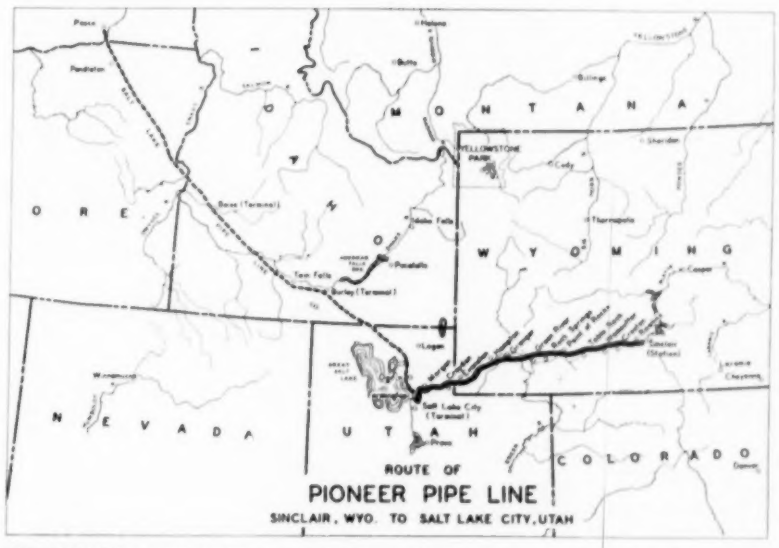
The pipe-line system climbs from 6,600 ft. at Sinclair to the Continental Divide near Cresson, Wyo., at an altitude of 7,120 ft., and reaches its maximum elevation at the Bear River Divide east of Evanston at 7,660 ft. (See Fig. 1).

At Wasatch, Utah, the line crosses the Wasatch Divide at 7,400 ft. and then begins its rapid descent into Lost Creek Canyon, which it follows to its junction with the Echo Canyon at Devil's Slide. From here it trails the Weber River to its point of emergence into the Salt Lake Basin and continues in a southwesterly direction to the Salt Lake terminal site in North Salt Lake on the Union Pacific Railroad. The line profile descends approximately 3,400 ft. in the last 60 miles.

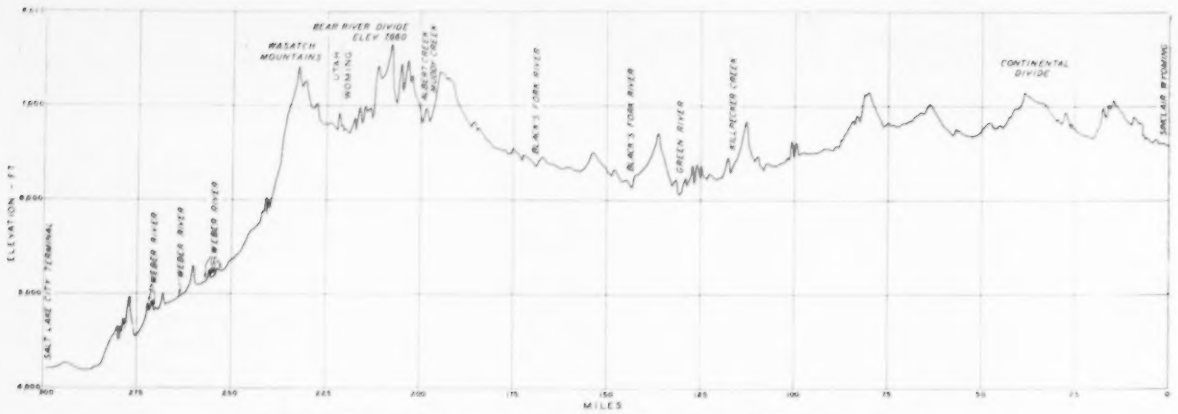
At present the line has one pumping station, which is at Sinclair, Wyo., providing an average capacity of approximately 12,000 bbl. per day.

Line Pressure Regulation

Two pressure-regulating devices are installed in the line at the Salt Lake City terminus. These regulators are


M O N T A N A
W Y O M I N G
N E V A D A
U T A H
C O L O R A D O
O R E
YELLOWSTONE PARK
Salt Lake City (Terminal)
ROUTE OF
PIONEER PIPE LINE
SINCLAIR, WYO. TO SALT LAKE CITY, UTAH

THE PIONEER PIPE LINE crosses the Great Divide on its way from Sinclair, Wyo., to Salt Lake City.



PROFILE OF LINE shows the rugged terrain transversed by the line. Fig. 1.

hooked up in parallel and operate in such manner that one or the other, depending on flow conditions, is controlling line pressure at all times. (See Fig. 2).

A high-pressure regulator relieves excessive line pressure and maintains a closed-in head of 1,400 psi. This pneumatic valve is operated in "air-to-close" fashion, as shown in Fig. 2. Thus, if the line pressure exceeds the air pressure, the valve will open to relieve the excess pressure.

The air pressure can be set and regulated at any predetermined value, since the air is supplied from high-pressure cylinders. This supply source is necessary since line shut-in pressure is 1,400 psi.

This arrangement also allows the Sinclair station to initiate pumping and maintain a flow in the line without overpressuring the system.

Control during operation . . . After flow has been established on startup of the Sinclair pumping station, a conventional air-operated pressure controller (see Fig. 2) takes over, the pneumatic valve on this controller holding approximately 400 psi. back pressure on the line at that point.

This holding pressure must be maintained to keep the line full at its highest point. The small-volume air requirements for this controller and the valve are met by a small air compressor discharging at 25 psi.

When this valve is in operation, line pressure is carefully watched by the station personnel. The greatest problem is not the danger of building too much hydrostatic head, but is really the problem of preventing the holding pressure from dropping to such an extent that the last 60 miles of line drains out, causing considerable contamination. Pressure pickups are used to sound a warning in the event the pressure becomes either too low or too high and manual adjustment is required.

In shutting down, the pressure controller is removed from service, and the Sinclair station pumps against the 1,400-psi. high-pressure regulator for a short time. The station is then shut down without danger of losing the packed line.

Construction . . . Four companies furnished pipe that went into the system. Seamless pipe was 24.70-lb. Grade X-46 and was located in the line on the downstream side of the initial station and the future intermediate station site near Green River. Electric weld 24.70-lb. Grade X-42 pipe was located next to the seamless on the Sinclair end of the line and the electric weld 28.55-lb. Grade X-42 pipe was laid on the western end of the line and a section immediately east of the Green River station site.

Radiographic examination of a percentage of the welds along the line was used on the entire construction job.

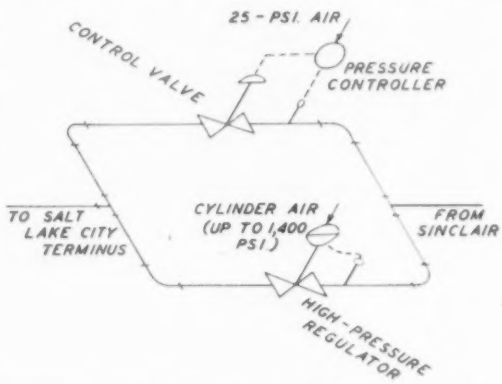
Coating consisted of 3/32-in. minimum thickness of coal-tar enamel and a wrapper of fiber glass pulled into the tar with a final wrapper of kraft paper over all.

The largest river encountered was the Green River, which was crossed at the town of Green River, Wyo. Several crossings of the Weber River were necessary as it descended through its canyon at the westerly end of the system.

In preparation for corrosion mitigation on the line, test points were installed at approximately 2-mile intervals as the line was constructed. Rectifiers will be used for corrosion protection. Numbered aerial markers also were placed at 2-mile intervals where practicable.

Pump station . . . The station at Sinclair is electrically driven, using full-

DISCHARGE HEADER at the Sinclair pump station.



PRESSURE CONTROL setup at Salt Lake City terminal. Fig. 2.

voltage-starting outdoor switchgear and explosionproof motors. Four pumping units are installed at the pumping station at Sinclair—three are 400-hp. units, and one 200-hp. unit.

Six-stage pumps were used in the 400-hp. units and a two-stage pump for the 200-hp. unit. All pumps are provided with mechanical seals. The rotors of the 400-hp. units are sized differently so as to be able to use them in various combinations, giving flexibility of pressure as products with different specific gravities are pumped. The 200-hp. unit represents the approximate difference in the pressure required between gasoline and distillates.

Two large units and a small unit are required to pump gasoline, and two of the large units will be required for pumping distillate.

Sinclair's refinery at Sinclair, Wyo., furnishes the products for transportation through the line. Individual suction lines are laid to the supply tanks and two booster stations installed near the station manifold for supplying the net positive suction head required for the station pumps.

A.S.A. standard 900-psi. valves and flanges with Schedule 90 fittings were used in the line block valves, scraper traps, and station discharge headers.

Motor-operated valves are installed on the individual tank lines at the manifold so that the tank changes can be made at the switchboard and at the same time main pump unit combinations changed to accommodate the gravity of the product that will be coming in. In this manner excessive throttling and power consumption, as well as excessive demand, will be prevented, which will have a very large effect on the power bill.

Salt Lake terminal . . . This terminal in the northern part of North Salt Lake near Woods Cross is built on a 68-acre site adjacent to the Union Pacific Railroad from which a spur serves a 10-spot tank-car loading rack. Storage provided at the terminal is 500,000 bbl., distributed as follows: three 80,000-bbl. tanks; two 40,000-bbl. tanks; two 30,000-bbl. tanks; and six 20,000-bbl. tanks.

The Salt Lake Pipe Line System, which transports products from the Pioneer to terminals at Burley, Boise, and Pasco, consists of a double 8-in. line from Salt Lake to Boise and a single 8-and-6-in. line from Boise to Pasco. At present one line is operated as a "local system" from Salt Lake to Boise, delivering all of the products used along this route. The other line is used as an "express line" to Boise, making no deliveries short of that point and transporting all products delivered beyond Boise, which includes the terminus of the line at Pasco.

Since products from the Pioneer system are transported in both lines, two 10-in. transfer lines of more than 2 miles in length were laid from the Pioneer Terminal to the pump station on Salt Lake Refinery Co.'s site. Deliveries are fed into Salt Lake Pipe Line suction at pressures between 50 and 125 psi. at rates of flow varying from 17,000 to 33,000 bbl. per day. Effort is made to schedule the products in such a way that each transfer line will be left full of the next type of product that will be batched out. When circumstances might make this impossible, a 6-in. return line provides facilities for purging either of the 10-in. transfer lines and starting delivery into the Salt Lake Pipe Line suction of whatever product conditions might demand.

Headquarters office . . . The operating headquarters office for the Pioneer system is located at the Salt Lake City terminal. It also serves as the terminal office and includes a warehouse, shop, and work-vehicle storage space. Communication between the headquarters and terminal offices at Salt Lake City and the station at Sinclair is maintained through leased teletype facilities.

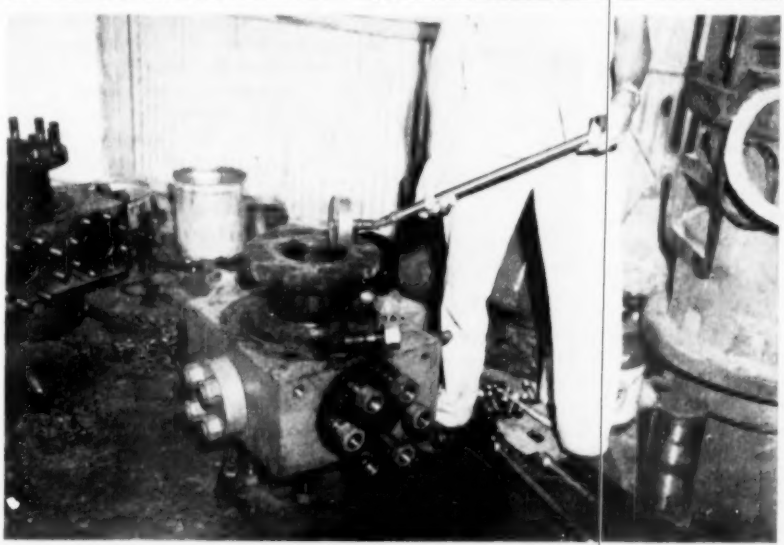
BOOKS

BETZ HANDBOOK OF INDUSTRIAL WATER CONDITIONING. By W. H. and L. D. Betz, Gillingham and Worth Streets, Philadelphia. 250 pp. $3.

This fourth edition of a well-known volume offers a practical up-to-date text for reference or study. The hankbook deals with such subjects as aeration, coagulation, softening, and others having to do with boiler-water and cooling-water conditioning. Applications and limitations of various water-treating equipment and methods are covered in detail. A supplementary section of the book is devoted to control-water analyses and their interpretation. With this handbook one does not need specialized knowledge of water chemistry and engineering to understand the basic problems involved and the latest developments in water technology.

FUNDAMENTALS OF RESERVOIR ENGINEERING. By John C. Calhoun, Jr. Published by University of Oklahoma Press, Norman. 420 pp. $6.

In this volume the author covers such subjects as: behavior of reserve fluids, study and treatment of rock properties, fundamentals of fluid flow in porous media, summary of reservoir energies and forces, and estimation of oil in place and oil production. The material is presented as a series of discussions, with clear and concise coverage of each subject. The material first appeared as a series of articles in The Oil and Gas Journal. The author does not offer this material as a text book, nor as complete coverage of the subject matter.



Lapping Tool for Overhauling Compressor Cylinders

A lapping tool for use in overhauling compressor cylinders may be made from a discarded piston from the same unit.

The tool consists of a T-bar handle connected to a machined-down piston by means of a universal joint.

The piston is carefully machined-down so as to fit into the compressor cylinder block snugly, but still allowing enough freedom so the tool may be conveniently worked. Initially, a heavy compound would be used with the tool and then as the lapping smooths the surface, a lighter compound would be used.

The tool was developed by Barney G. Harbison, at Southren Minerals Corp. gasoline plant in Stratton field, South Texas.

EQUIPMENT MEN . . . in the News

American Iron Transfers Curtis to Midland

Bryan Curtis has recently been transferred from district manager of American Iron & Machine Works Co.'s Houston office to Midland, where he will serve as district manager of the West Texas and New Mexico area.

Curtis joined American Iron sales force in 1936, and has represented the company at New Iberia and Harvey, La., Corpus Christi and Monahans, Tex., and spent 2 years in the Oklahoma City office. Curtis was appointed district manager of the Houston office in 1947 and served in that capacity until his recent transfer.

Tough Is Sales Manager of Watson-Stillman Fittings

J. M. TOUGH

The appointment of J. M. Tough as sales manager, Watson - Stillman Fittings Division, H. K. Porter Co., Inc., Roselle N. J., has been announced by Jackson Kemper, vice president and general manager.

Tough, who has been with Watson-Stillman since 1942, will be responsible for the company's entire sales activities. He came to the company as a sales representative and later was made district manager of the Chicago territory. He continued in that capacity until his present appointment.

Previous to his coming to Watson-Stillman, Tough served as branch manager, New York territory, for Ahlberg Bearing Co.

Hewitt-Robins Opens Houston Maintenance Plant

Hewitt - Robins recently announced the opening of a factory maintenance center in Houston to repair and service rotary drilling hose. The new department will be located in the company's south central division headquarters. The equipment will include a steam vulcanizer, building machine, and testing equipment.

Hose which becomes punctured or otherwise damaged will be repaired and recoupled quickly in the Houston shop, thereby saving considerable time and money for oil-well operators. In addition, the shop will be equipped to make vibrator hose out of rotary hose which is no longer usable as rotary hose.

Alten Foundry Names Belcher as Representative

W. A. BELCHER

Warren M. Benson, vice president and sales manager, Alten Foundry & Machine Works, Lancaster, Ohio, has announced the appointment of W. A. (Lon) Belcher as sales representative. Formerly with Petroleum Specialty and Greenhead Supply companies, Belcher is a veteran oil-field salesman. He will direct sales of Alten and Ideco - Type pumping units throughout Oklahoma.

Denison Engineering Co. Opens New Houston Office

New and larger office and service facilities at Houston have been opened by Denison Engineering Co., makers of hydraulic presses and components.

Denison Neale is direct factory representative for the company, Columbus, Ohio, and manager of the new facilities. Neale points out the rapidly expanding use of hydraulic equipment in the petroleum industry, as well as in manufacturing operations, is prime reason for the expansion of his firm's Houston offices.

The new branch will include facilities for testing, overhaul, and general customer service, as well as a complete inventory of Denison HydrOILic pumps, motors, controls, and replacement parts.

National's Midwest Division Makes Changes

C. K. McDONALD

Four personnel changes in the Midwest division of National Supply Co. have been announced, following the recent promotion of Kenneth O. Hoevel, divisional sales manager of Northwest division.

Carey K. McDonald, district manager, has been named division sales manager; Norman E. Allen, division merchandising supervisor, was promoted to district manager; R. A. Heckel, sales engineer for rotary equipment, became assistant division sales manager; and Lee A. Douthat, assistant office manager, was named division merchandising supervisor.

N. E. ALLEN

R. A. HECKEL

McDonald started with the company in 1928 as a clerk in the Tulsa store. He had subsequent experience at Ada, Okla., and Stafford, Kans. He was appointed assistant district manager at Tulsa in 1942 and district manager in 1943.

Allen started in the Tulsa store in 1927 and held various positions in the sales, credit, purchasing, and engineering departments. He was named assistant manager in 1943 and division merchandising supervisor in 1949.

Heckel started in 1926 in the store at Garber, Okla., and had other experience at Wichita, McPherson, Russell, and Hayes, Kans., and in Oklahoma City. He was named sales engineer for rotary equipment at Tulsa in 1947.

Douthat started in the Independence, Kans., store and served later in Winfield, McPherson, and Chase, Kans., rising to assistant office manager at Tulsa. He served the export division in Venezuela during part of 1953.

Robert Maddocks Joins Blaw-Knox Tulsa Staff

R. R. MADDOCKS

Robert R. Maddocks has been appointed chief process engineer of the western headquarters of Blaw-Knox Co.'s chemical plants division, it has been annouced by F. Drake Parker, manager of the Tulsa organization.

Maddocks has been active in the design, construction, and operation of petroleum refining and petrochemical plants. He has been associated with Pennzoil Co., Arthur G. McKee & Co., Petrochem Development Co., and Bechtel Corp. While with the construction firms, he was a key figure in the recent major refinery modernization and expansion carried out by Standard Oil Co. of Ohio, Sinclair Refining Co., California Oil Co., and Petroleos Mexicanos.

Schlumberger Opens Four New Operating Centers

Four new operating centers to bring Schlumberger service closer to centers of increased drilling activity have been opened by Schlumberger Well Surveying Corp., Houston.

Three of the new offices are in South Louisiana at Donaldsonville, Morgan City, and Golden Meadow. Operations began at Donaldsonville and Morgan City in October, and at Golden Meadow and Refugio, Tex., the fourth new center, in November.

The Donaldsonville center is under supervision of J. T. Douglas; Morgan City under William H. Player; and Golden Meadow under Ben Ryland. F. A. Rice is in charge of the Refugio location.

A policy of the corporation is to disperse its operating equipment, where activity warrants it, in order to obtain greater efficiency. The Refugio district, although oil producing for many years, now has increased activity due to new leasing in the vicinity. In South Louisiana, operations are unique in that a high percentage of drilling and service equipment is transported by barge over the many bayous and bays of the area. Here, especially, the new centers will bring savings in time to drilling operators.

Otis Men Review Permanent Completion Article

Four Otis Pressure Control executives look over an article on permanent-completion practices appearing in the December 7, 1953, issue of The Oil and Gas Journal. They are: (left to right) D. F. Daffin, service operations manager; Harry Schramm, chief engineer for Otis Engineering Corp., manufacturing affiliate of Otis; Herbert Otis, Jr., vice president; and T. G. Garwood, sales manager. Schramm, who assisted in the preparation of the Journal article, also represented Otis during the firm's collaboration with Humble Oil & Refining Co. in the original development of the new completion process.

North Made Assistant to Marlow Sales Manager

Marlow Pumps, of Ridgewood, N. J., manufacturers of self-priming centrifugal pumps, has announced the appointment of John L. North as assistant to sales manager, with headquarters in Ridgewood. Prior to his association with Marlow, North worked in an engineering capacity for Hinde & Dauch Paper Co.

Harper Names Channer As General Sales Manager

E. A. CHANNER

H. M. Harper, president of H. M. Harper Co., Morton Grove, Ill., manufacturers of corrosion-resistant fastenings, has announced the appointment of Earle A. Channer as general sales manager.

Channer joined Harper in 1939, after attending Kenyon College. He served as a lieutenant in the Army Air Corps and, upon discharge, was made district manager of Harper's Cleveland office. In 1951 he was promoted to eastern district sales manager, with offices in New York, and the following year served in Washington with NPA.

Merla Tool Elects Officers At Annual Meeting

Pictured at the recent annual sales meeting of Merla Tool Corp. held in Dallas are: (first row, left to right) C. D. Fletcher, John Valdez, Roy A. Lamb, Howard Shireman, V. A. Kagay, and John Eads, Wichita Falls; (second row) Clif Mock, Houston; Odell Shaw, Oklahoma City; R. Henke, J. D. Phillips, Corpus Christi; Malcolm Hudson, Wichita Falls; J. Robinson, Odessa; and George Kingsley; (third row) Houston Parish, Corpus Christi; M. H. Kirkgard, Art Robinson, Lloyd Gwinn, Randall Larkin, Shreveport; and B. J. Rhoads, Jr., Odessa. At the same time, new officers were elected as follows: Roy A. Lamb, president; V. A. Kagay, secretary and general manager; and R. D. Henke, director.

ARE YOU PAYING MORE THAN $200.00 FOR *ROTARY HOSE?*

LET BARNEY EXPLAIN WHY YOU SHOULDN'T

TO THE OIL INDUSTRY:

Here are some **facts** about rotary hose that are almost unbelievable.

In a nut-shell: YOU CAN ACTUALLY BUY A 55-FOOT LENGTH OF GOODALL LONG-LIFE ROTARY HOSE AT A NET COST OF LESS THAN $200.00.

Startling? Sure!

Compare these figures:

Cost of new 3x55 Goodall Rotary Hose with Barney Couplings	$1517.89
Out-of-pocket cost for resetting couplings	100.00
Total cost for Double-Life rotary hose service	$1617.89

OR, FOR EXAMPLE,

Take the cost of a new 3x55 Goodall Rotary Hose with Barney Couplings	$1517.89
Add cost for furnishing and resetting couplings to make two 3x15 vibrator hose	250.00
Subtract normal cost of 2 new 3x15 vibrator hose @ 744.10	1488.20
Then, when the 2 sets of Barney Couplings used on the vibrator hose are returned, you are allowed a credit of $50.00 per set	100.00
NET COST TO YOU FOR 1 3x55 ROTARY HOSE **AND** 2 3x15 VIBRATOR HOSE	$ 179.69

Thus, you started with a $1517.89 investment in a rotary hose. And then, after receiving maximum service, you get a renewed rotary hose for only $100.00 or 2 vibrator hose with a value of $1488.20. Therefore, your out-of-pocket money, with Goodall Rotary Hose, is less than $200.00. (The 3x15 vibrator hose is used as an example, any length hose can be furnished.)

No other rotary hose manufacturer can offer you this type of bargain in rotary hose . . . because no other rotary hose manufacturer has the Barney Coupling that can be reset to save your hose from the scrap heap. Specify Goodall to your supply store. It's available through all stores, now, wherever you operate.

Thanks,
Barney

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TRENTON, N. J.

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GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City, Portland
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit
EXPORT: Goodall Rubber Company, Trenton, N. J.
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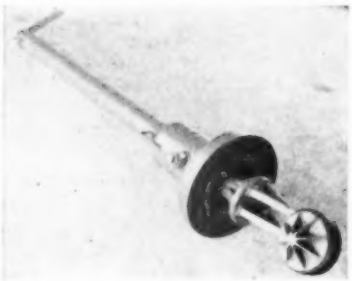
DIGEST OF NEW EQUIPMENT

IT'S NEW ✓ CHECK IT

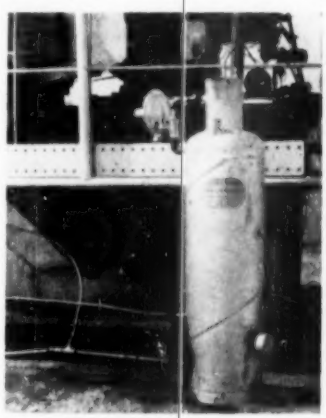
by Dan B. Miller

1 HIGH-PRESSURE PIPE-PLUGGING DEVICE. The Stopple is a simple and effective device which can be inserted into a pipe line through a tapped side opening, thus providing the equivalent of a temporary gate valve in any desired location. In operation, a hole is tapped through the pipe wall using approved tapping techniques which require no expensive shutdown. The tapping machine is then removed from the tapping valve and the Stopple is installed in its place. Turning the crank is all that is required to move the sealing element into the pipe line where it automatically seats in the pipe section adjacent to the tapped hole. The resulting closure stops the flow of fluid so that many field jobs can be accomplished without draining the line. When used in pairs, complete sections of pipe, or valves and fittings, may be removed and replaced between Stopples. Bypass connections are provided so that operations may often be continued while repairs and additions are going on. After completion of a job, the tapping valve can be removed, leaving nothing but a blinded flange on the pipe line, all without shutdown or drainage, often without reduction in pressure. *T. D. Williamson, Inc.*



IT'S NEW ✓ CHECK IT

2 GAS-OIL SEPARATORS, a new individual differential-flow liquid gas-oil separator is easy to install at the well, and eliminates the cost of laying gas lines from tank battery back to the pumping wells. The principle is to separate a dry gas from oil and return all excess gas and oil to the flow line. On wells with low gas-oil ratio, the exhaust from the engine passes through the separator, heating the oil and separating the lighter gases to operate the engine. On some wells, producing a small amount of water, heating the oil will cause the water to settle out in the storage tanks. On wells using gasoline or butane, it will cut operating cost. It has been used successfully on both single and multicylinder engines. It operates without moving parts other than a universal-control trouble-free regulator to reduce the gas pressure to the engine. All other operations are caused by the differential pressure created in the flow line. *Torres-Beacom, Engineers.*



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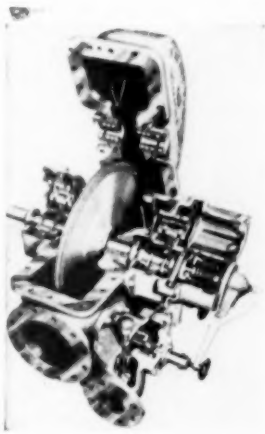

3 IMPROVED DEAN HILL TURBINES deliver extra power. A major change was the addition of a steam nozzle to all models. The new, two-nozzle DH-10 and DH-20 turbines have double the maximum horsepower of former units. The DH-10 is now equipped with water-cooled bearings and a maximum of four carbon rings instead of three. Models DH-30, DH-40, and DH-45 now have three steam nozzles instead of two, and these turbines have a 50 per cent increase in horsepower. A redesigned governor valve and trip valve eliminates the use of packing on valve stems for high pressure and temperature turbines. Addition of a

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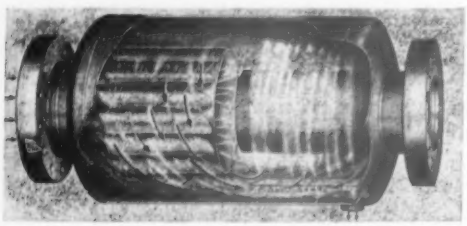
hand valve increases part load performance. New, larger, improved, carbon-ring packing glands increase maximum back pressure from 50 to 75 psi. *Dean Hill Pump Co.*

IT'S NEW CHECK IT

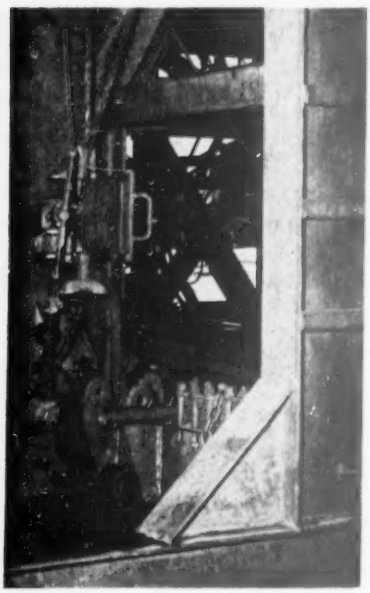
4 NEW MOISTURE SEPARATOR is for use in horizontal steam, air, and gas lines. The new device, identified as the 31-N separator, is a refinement of the 30-N type separator. Like the 30-N, it installs in minimum space,



occupying scarcely more space than the section of pipe it replaces. The 31-N is self-cleaning, and may be used with a wide range of pressures. Construction is fabricated steel. The centrifugal force principle is applied in the new separator for removing entrainment, including water, oil, and solids from the pressure line, delivering a clean flow to the equipment. *Wright-Austin Co.*

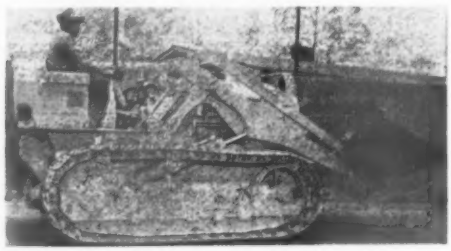
IT'S NEW CHECK IT

5 ANCHOR CLAMP USED ON PORTABLE DERRICKS. Introduced 3 years ago for use on standard derricks, the Deep Well Deadline Anchor Clamp is now being used in the field on jackknife (portable) derricks. The picture shown here was taken on a deep wildcat well southwest of Lindsay, Okla., which was then drilling below 11,900 ft. Engineers are now working on a standard tiedown in order that the clamp will come into more general use on heavy jackknife derricks. *New Deal Specialty Co.*



IT'S NEW CHECK IT

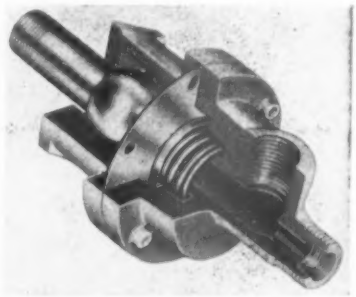
6 NEW IMPROVED STANDARD BUCKET for the Caterpillar HT4 shovel will provide greater flexibility because of an adjustable pitch and deeper bowl. This will



make the unit ideal for either excavating or stockpile applications. The two positions now available are achieved by changing the removable pins on each side of the bucket to either the forward or rear hinge points. The forward hinge point for stockpiling gives quicker tiltback and less spillage because of a 10° rackback at the ground line. A simple adjustment connecting the bucket to the rear hinge points retains the former digging and dumping angles desirable for excavating work. Redesigned bucket teeth are also available for the improved bucket, now standard equipment on the Caterpillar HT4 shovel. *Caterpillar Tractor Co.*

IT'S NEW CHECK IT

7 PHILLIPS ROTARY JOINTS. The new type, packless and leakproof rotary joint operates on the ball-and-socket principle, and is manufactured in two types: the through - flow type, a single inlet unit designed to transfer liquids or steam into or out of any revolving drum; and the siphon type (illustrated), designed for installations where inlet and outlet are desired in the same unit, or for siphon drainage of condensate from the steam chambers of a roll or drum. The new products are designed for highest efficiency, long life, and greatest economy on all services on which they are to be used. They can be used in both high and low-pressure installations. *Key Co.*



IT'S NEW CHECK IT

8 NEW L-K SWIVEL SPINNING CHAIN ADAPTER is designed to accommodate the use of any size spinning chain to any L-K swivel. After the chain ring is removed, the interchangeable adapter is fitted in place. The end chain link of the spinning chain is simply inserted in the slotted end of the adapter and a drive-drift pin is put in place, holding the link. The chain can be easily removed when necessary by driving the drift pin out. The adapter is fully ball bearing and has the same tested strength as the swivel. The heat-treated alloy-steel drift pin has more than three times the strength of the regular spinning chain.

L-K swivels sell with the adapter instead of the chain ring at the same price. *L-K Pump Valve Co.*

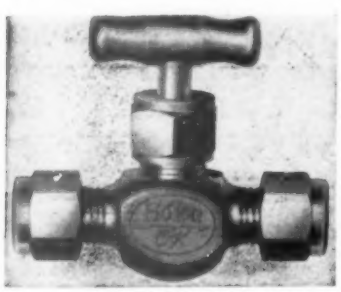
IT'S NEW CHECK IT

9 NEW MICHIGAN TRACTOR SHOVELS. The three major types in production are: Two-wheel drive with bucket-wheel drive and rear-wheel steering; two-wheel drive with rear-drive wheels and bucket-wheel steering; and four-

wheel drive with rear-wheel steering. The equipment will be made in six models, ranging in capacity from 15 cu. ft. to 2¼ cu. yd. Individual models and catalog designations are: 12-B — 15-cu.-ft. capacity, bucket drive, rear-wheel steering; 75-B—1-cu.-yd. capacity, bucket drive, rear-wheel steering; 75-R—1-cu.-yd. capacity, rear-wheel drive, bucket steering; 75-A—1-cu.-yd. capacity, four-wheel drive, rear-wheel steering; 125-A—1⅝-cu.-yd. capacity, four-wheel drive, rear-wheel steering; and 175-A—2¼-cu.-yd. capacity, four-wheel drive, rear-wheel steering. The tractor-shovels will utilize a new transmission. The transmission, which incorporates a torque converter with a 3:1 torque multiplication factor, is a constant-mesh type with full-pressure lubrication. It is operated from two manual control levers on the steering column. Another lever emerging through the floor board controls the overdrive. *Clark Equipment Co.*

IT'S NEW CHECK IT

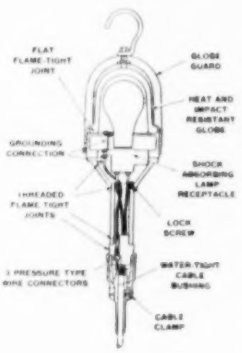
10 NEW LINE OF SMALL INSTRUMENT AIR VALVES. These instrument air valves, manufactured by Hoke, Inc., are equipped with Crawford Swagelok ends to provide leakproof and torque-free seals on every type of instrumentation installation. An arrow embossed on valve body shows direction of flow. At present, these instrument air valves, equipped with Swagelok ends, are being made in brass, aluminum, steel, and stainless steel. They are available in the smaller sizes from stock. *Crawford Fitting Co.*



IT'S NEW CHECK IT

11 NEW ALLOY LINK TYPE DRILLING JAR. This heat-treated, alloy-steel, link-type drilling jar represents an improvement in the physical properties of the material in the jars and in heat-treating procedures. These improvements have been made possible by modern procedures in welding high-alloy steels and by new forging and finishing methods. This new alloy-steel jar combines high strength, wear resistance, and toughness to achieve two to four times the service life received from regular carbon-steel jars. *Acme Fishing Tool Co.*

IT'S NEW CHECK IT



12 LIGHTWEIGHT EXPLOSIONPROOF HAND LAMP. This new explosionproof, raintight hand lamp weighs 4¾ lb. Only the globe guard, globe holder, and cord connector housing are aluminum. The lamp receptacle housing, aluminum on earlier models, has been replaced by a lightweight high-impact molded phenolic composition. Phenolic bone fiber, another strong lightweight material, forms the lamp handle. The new lamp also has much higher impact-resisting qualities. Its globe is seated firmly against a metal flange by a heat and impact-resistant globe guard. Drop tests have demonstrated that the globe cannot loosen, even under severe shock. Both lamp chamber and handle are explosionproof, separated by the lamp receptacle. But flame-tight joints, located along the globe holder, handle, and cord connector, prevent an explosion in one compartment from being transmitted into the other. These joints have five or more full threaded turns that, after an explosion, allow only cooled gases to escape. The use of pressure-type wire connectors in the cord connector assembly minimizes the danger of wires being pulled free under the strain of continuous wear. *Crouse-Hinds Co.*

IT'S NEW CHECK IT

13 PHOSPHOR BRONZE STRIP, precision rolled to very close tolerances and to thin gages and foils, for use in the manufacture of equipment for the oil, gas, and petroleum processing industries, is now readily available. The metal possesses high tensile and yield strength, good ductility, resiliency, high fatigue strength, wear resistance, and good bearing qualities. Phosphor bronze is rolled in strips up to 6 in. wide and down to 0.0005 in., to tolerances as close as ± 0.0001 in. Typical uses for phosphor bronze strip in the oil, gas, and petroleum-processing industries include: bellows and diaphragms; high-strength springs and brushes; fuse clips, sleeve bushings, lockwashers, and fasteners; snap switches, socket and plug contacts; printed circuits; bourdon tubes; and clutch disks. *American Silver Co.*

IT'S NEW CHECK IT

TRADE LITERATURE

14 PRESSURE TYPE FILTERS. The bulletin describes the details of design and construction of these units, which are built in both vertical and horizontal types, together with all the accessory equipment furnished to help promote maximum efficiency. The various available arrangements of valves and piping, and aids in their selection for individual requirements, are also fully discussed. Many illustrations of installation are included, together with complete tables of capacities, dimensions, and weights for both horizontal and vertical filters. *Graver Water Conditioning Co.*

15 A SIGNIFICANT DEVELOPMENT IN COMPRESSOR HISTORY: Bulletin No. 132 covers pertinent information of a new two-cycle, turbocharged, right-angle compressor. Features claimed for the new design are greatly increased power; fuel economy; less water-cooling load; flat fuel consumption load; and quiet, trouble-free operation. The unit is offered in five sizes, from 825 to 1,650 b.hp. *Clark Bros. Co.*

16 HEAT INSULATION WITH ROCKSIL, an eight-page, two-color brochure, discusses heat insulation of all kinds in the petroleum industry. Illustrations show flexible sections on piping, and sheet-metal casings on distillation equipment. *Wm. Kenyon & Sons, Ltd.*

17 THE DICKSON MINDICATOR carries illustrations and complete engineering data on a compact instrument for either temperature or pressure, to be mounted on a panel board. The equipment features accurate indication on an extremely legible scale. *The Dickson Co.*

18 WHICH ENGINE SHOULD POWER YOUR EQUIPMENT is an illustrated article prepared by A. F. Milbrath, vice president and chief engineer of Wisconsin Motor Corp. The article covers: selection of the proper engine size, engine speed and torque, type of drive, design and constructural features, and engine mounting. *Harley Sales Co.*

19 CORWEL JOINTS. Rules for welding and breaking a combination flanged-welded joint are covered in this 2-color, 12-page booklet. Detailed procedures for assembly of joints, bolt removal for welding, preheating for welding, welding procedure, and breaking of Corwel joints are given. *Aiton & Co., Ltd.*

20 BRIDGING PLUG. This new literature gives details on a drillable plug used to form an off-bottom bridge on which sand, cement, or other material can be dumped. Plug is secured to casing wall against downward movement by a set of notched dogs. *Cavins Co.*

21 HORIZONTAL BOOSTER PUMPS. Bulletin B-1400 covers complete details and description of multistage pumps for puming hot or cold liquid in moderate capacities against medium and high heads. Available in two, three, four, and five-stage designs; capacities range to 3,500 g.p.m. *Peerless Pump Division, Food Machinery & Chemical Corp.*

22 3 WAYS TO WHIP CORROSION AND HIGH TUBING-INSTALLATION COSTS IN YOUR PLANT. Bulletin L-6506 describes Dekoron Impervapak, an instrument line harness that is impervious to attack from even the most severe industrial atmosphere or weather conditions. Individual flexible metal or plastic tubes are incased in a vinyl plastic sheath, so that there is no need of installing instrument lines one at a time. *Samuel Moore & Co.*

23 LIGHT-WEIGHT SPUR GEAR HOIST is a new four-page, two-color bulletin describing a light-weight spur-gear hoist of formed steel construction that features easy portability and resistance to shock load breakage. Included in the bulletin is a cutaway drawing indicating its simplicity of design and ease of servicing. Other hoist features, dimension drawings, and specifications for the ½, 1, and 2-ton models are also included. *Coffing Hoist Co.*

24 COOLING-TOWER DRIVES. To meet every cooling-tower drive condition, a complete line of speed reducers is introduced in each of the following types: worm-gear unit; spiral-bevel unit; and helical-spiral-bevel unit. Each of these types is manufactured to full A.G.M.A. standards, and they cover the range of horsepower and reduction ratios demanded by the cooling-tower industry. Catalog No. CT-53 offers much valuable information on the use of gear-reduction drives in cooling-tower applications. This new catalog also gives full construction and operation details, illustrations, and selection data for Philadelphia reducers. *Philadelphia Gear Works.*

25 PRICHARD HYDRYERS. Bulletin No. 16.0.081 describes a line of dependable packaged dehydration units for efficient drying of air or other gases in industrial, processing, and laboratory installations. The eight-page, two-color brochure shows flow diagrams of full-stream and split-stream reactivation as well as selection charts for instrument-air Hydryers. *J. F. Prichard & Co.*

26 AIR-POWERED CONTROLLED VOLUME PUMPS. This new 16-page bulletin No. 1053 shows how these pumps are used to solve low-capacity flow-control problems. It contains a graphic presentation of pump operating principles; capacity-pressure and air-consumption tables; and examples of completely engineered chemical feed systems, using these instruments. *Milton Roy Co.*

27 NEW RUST-OLEUM GENERAL CATALOG. The new, enlarged catalog features 94 color chips of Rust-Oleum products, and includes complete instructions for surface preparation and application of Rust-Oleum primers, short-oil type, long-oil type, machinery and implement finishes, chemical and heat-resistant types, sealers, oil-field finishes, thinning oils, and floor and masonry coatings. *Rust-Oleum Corp.*

28 VAPOR BARRIER BOOK. Complete recommendations for vapor sealing insulation on low-temperature vessels are given in an 80-page, edition-bound volume. The book contains 54 illustrations showing exactly where and how a vapor seal coating should be applied over thermal insulation. The purpose of such a coating is to prevent deterioration of the insulation and rusting of the vessel beneath it due to moisture and moisture vapor. *Insul-Mastic Corp.*

29 LONG-SCALE SWITCHBOARD INSTRUMENTS. A new 24-page bulletin on long-scale switchboard instruments, designated GEC-218C, contains a description of the company's AB-DB-18 and AB-DB-16 instrument lines as well as principles of operation, characteristics, and specifications. Prices and dimensions are also provided. *General Electric Co.*

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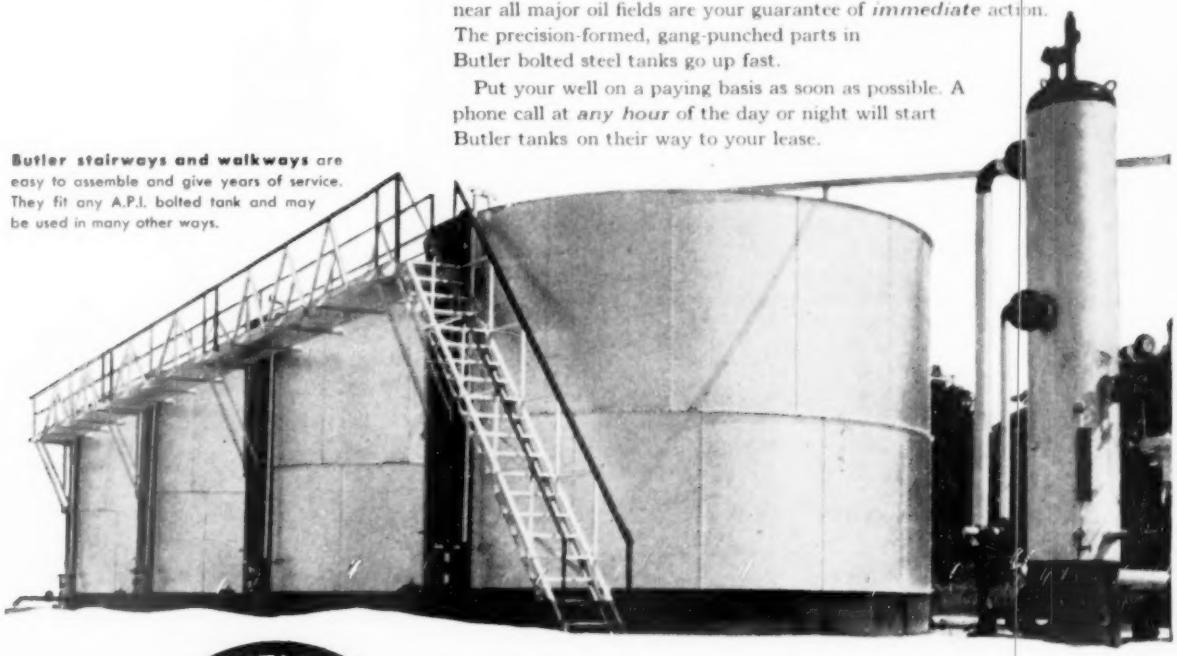

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NATURAL GAS

Northern Gets FPC Go Ahead To Take Permian Basin Gas

OMAHA. — Northern Natural Gas Co. has the approval of the Federal Power Commission to receive an additional 200,000,000 cu. ft. of natural gas daily into its system and deliver it to customers in Nebraska, Iowa, Kansas, Minnesota, and South Dakota.

The company said FPC issued an order permitting it to operate newly completed pipe-line facilities to handle gas delivered to it by Permian Basin Pipe Line Co., which has its system running through the Spraberry Trend area to Hobbs, N. M., in partial operation. Permian is a subsidiary of Northern Natural.

A Northern Natural official said the increase boosts capacity of its transmission system to more than a billion cubic feet of gas daily.

It is expected that Northern eventually will be taking from Permian about 300,000,000 cu. ft. of gas daily or more from the Spraberry Trend area and from high-pressure gas fields south of Hobbs.

Cities Service Seeks SEC Authority to Sell Gas Firm

NEW YORK.—Cities Service Co. is seeking Securities and Exchange Commission authority to sell 1.5 million shares of stock in Gas Service Co., a natural-gas distributing subsidiary.

The sale, which is planned for some time in January, is part of plan announced last May by Cities Service to move out of the natural-gas business. The company also plans to sell its holdings in Republic Light, Heat & Power Co. and Penn-York Natural Gas Corp. to National Gas Co.

Gas companies controlled by Cities Service operate production, transmission, and distribution systems primarily in Kansas, Oklahoma, Missouri, Arkansas, Nebraska, Texas, Louisiana, New York, and Ontario.

Texas-Illinois to Complete Expansion of Capacity Soon

CHICAGO.—Texas-Illinois Natural Gas Pipeline Co. will complete an expansion program about the middle of this month raising capacity of its big-inch transmission line from the Texas Gulf Coast to near Chicago by 130,000,000 cu. ft. daily, according to officials of Peoples Gas Light & Coke Co., Texas-Illinois parent firm.

New capacity of the line will be more than 500,000,000 cu. ft. daily.

The capacity boost results from the completion of construction of six new compressor stations along the 1,400-mile route of the line and from the installation of an additional 2,000 hp. in compressor facilities at each of the original 10,000-hp. stations.

Cost of the expansion program, Peoples officials say, now is estimated at about $33,800,000, as compared with the original estimate of about $40,000,000. This estimate does not include a new bridge for the line to be built across the Mississippi River.

Mississippi Gas Output for January at 13,000 M.M.c.f.

JACKSON, Miss.—A maximum production of 13 billion cubic feet of gas will be permitted by the Mississippi Oil and Gas Board from the state's six natural-gas fields in January.

Allowable production by fields in January will be: Gwinville field in Jeff Davis and Simpson counties, 8.5 billion cubic feet; Soso field in Jasper, Jones, and Smith counties, 735 million cubic feet; Baxterville field in Lamar and Marion counties, Eutaw sands 2.8 billion cubic feet, Wilcox sands, 1,128 million cubic feet; Sandy Hook field in Marion County, 1.1 billion cubic feet; Sharon field in Jasper and Jones counties, 286 million cubic feet; and Fayette field in Jefferson County, 137 million cubic feet.

Pacific Northwest Reserves Now Said at 3.56 Trillion

HOUSTON. — Natural-gas reserves committed for Pacific Northwest Pipe Line Co.'s proposed big-inch transmission line from the San Juan basin to the Pacific Northwest now total 3.56 trillion cubic feet, according to recent testimony before the Federal Power Commission by officials of the firm.

The reserves available for pipe-line transmission were said to include about 3 trillion cubic feet in the San Juan basin, about 460 billion cubic feet in the Big Piney Unit of the Green River basin in Wyoming, and another 100 billion cubic feet in Colorado.

Reserves estimates, made by DeGolyer and MacNaughton, were based on gas withdrawal to 500-psi. abandonment pressure.

In its application to FPC, Pacific Northwest testified that its project would serve about 3,000,000 persons. Arrangements have been made, company officials said, for the purchase of gas from the company at Seattle, Spokane, and all principal cities of Washington and northern Oregon except Portland, Ore.

FPC Postpones Hearing

WASHINGTON.—A hearing on a proposal by South Georgia Natural Gas Co., Birmingham, to supply southern Georgia and northern Florida with natural gas has been postponed from January 18 to March 29 by the Federal Power Commission upon request of the applicant.

The proceedings are part of a rehearing opened last August after the commission denied South Georgia's application in May. The postponement was granted to give the proponents and opponents of the project sufficient time to gather new evidence.

South Georgia's plans include construction of a transmission system throughout the market area *(The Oil and Gas Journal, November 30, page 129).*

A.G.A. Expanding Lab

CLEVELAND. — A $200,000 wing is being added to the American Gas Association Laboratories here.

The new 17,800 sq. ft. addition will be devoted primarily to testing central heating units. It will be completed in mid-1954.

Natural Gasoline

Shell Near Completion of Ventura Avenue Expansion

VENTURA.—Shell Oil Co. has completed the major portion of a multi-million-dollar expansion program at its natural-gasoline plant in Ventura Avenue field near here.

New equipment recently placed in operation includes a 97-ton still, a 57-ft. absorber, and a 77-ft. depropanizer. In addition two 3,000-bbl. storage spheres were erected, and the gas-gathering lines enlarged and expanded. Completion of the project will result in the plant's capacity being increased about one-third. The plant currently produces about 4,770 bbl. daily of natural-gas liquids.

Among the

Drilling Contractors

Clark Leaves Parker to Go With Falcon Seaboard

L. B. (Si) Clark, who has been contract representative for Parker Drilling Co., Tulsa, for several years, now is associated with Falcon Seaboard Drilling Co., also of Tulsa, as special representative.

L. B. CLARK

In his new position, Clark will devote much of his time to expanding Falcon Seaboard's activities in the Mid-Continent area, T. N. Law, president of the latter company, announces.

Clark started in the oil business with United Supply Co., working in the Odessa, Denver City, Eunice, and Sundown areas, of West Texas and New Mexico. Following World War II, in which he served in the U. S. Navy, he worked in the export division of Lucey Products Corp., in New York City.

A native Tulsan, he is a graduate of Tulsa schools. He also attended George Washington University, Washington, D. C.

Big "6" Drilling Co. has contracted for a 7,000-ft. wildcat test to be drilled for Reynolds Mining Corp. at 1 McCan, in the C. O. Edwards Survey, 18 miles south of Victoria, in Victoria County, in the lower coastal district of Texas.

Bissett & Edwards Drilling Co., Houston, has a contract with M. M. Kinley, oil-well fire fighter, for a Cockfield test to be drilled in the North Bancroft area, Beauregard Parish, Coastal Louisiana. The test, 1 Lutcher-Moore, in 19-9s-12w, is projected to 8,000 ft.

Gilger Drilling Co., Houston, has contracted with Pan American Production Co. for an 11,300-ft. test to be drilled at an outpost location west of

On the floor of a rig Holmes Drilling Co., Houston, is operating under contract to Stanolind Oil & Gas Co. near McAllen, in Hidalgo County, Rio Grande Valley, Texas. Standing, left to right: H. L. Brewer, Stanolind tool pusher; Shad Mims, Mission Manufacturing Co.; John B. Holmes, contractor; A. B. McLamore, and John Willis, drilling superintendent and tool pusher, respectively, for Holmes; and Ken White, crewman. Front row, same order: W. L. Sosebee, T. P. Owens (driller), O. L. Drake and J. D. Offield, drilling crew. (Picture by courtesy Mission Manufacturing Co., Houston).

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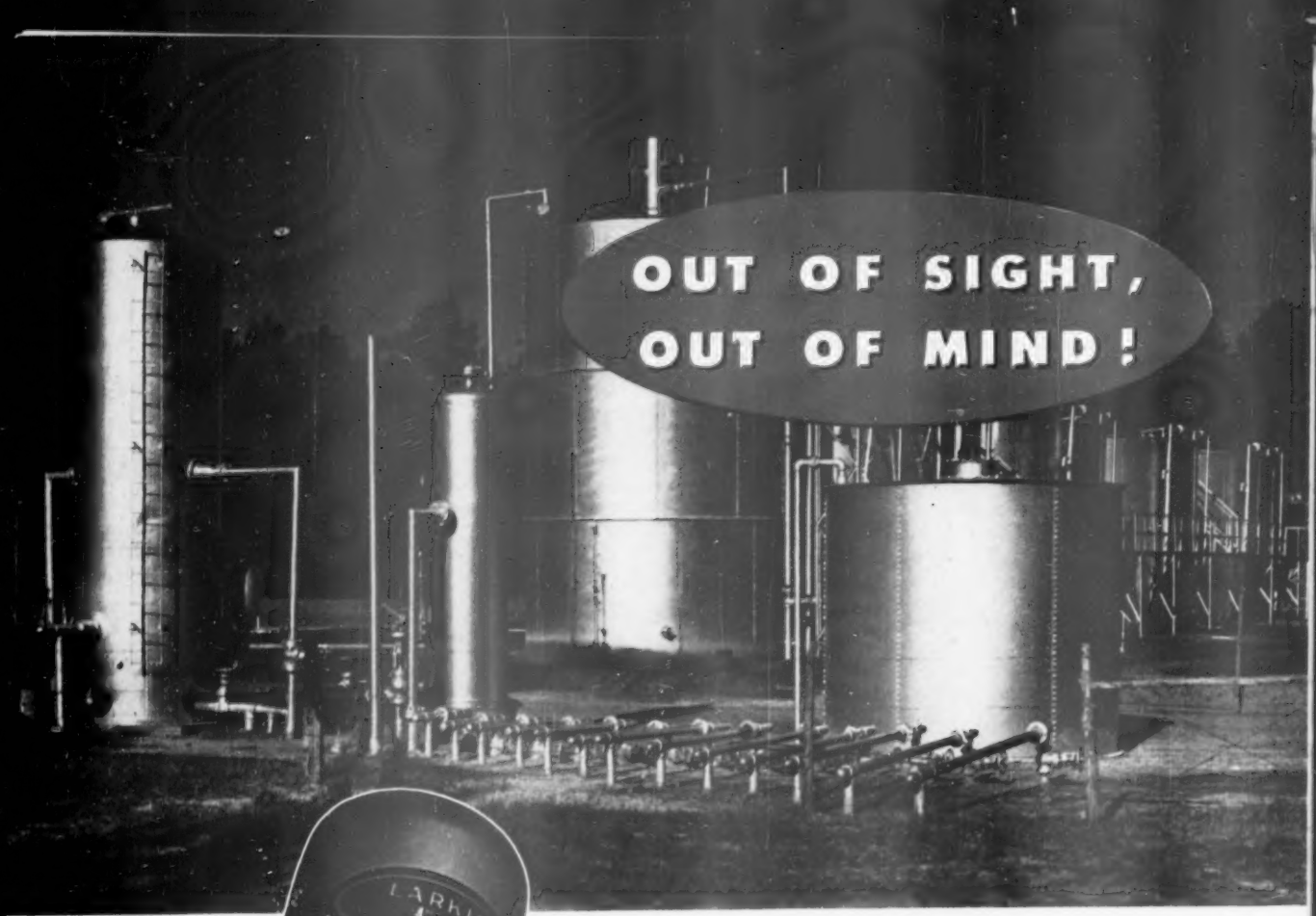

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Shuteston field, in St. Landry Parish, Coastal Louisiana. Location is for 1 Lavergne, in 26-7s-3e.

C. N. Housh, Houston, has moved a rig to a townsite location at Columbus, in Colorado County, South Texas, where he will drill a deep test, a wildcat, for Fidelity Oil & Royalty Co., of Houston. The test is listed as 1 Miller.

Texita Oil Co., San Antonio, is under contract to Willard Shuart, of San Antonio, for a 7,000-ft. test, located at 1 Smith, in Section 33, Laureles Farm Tracts, 5½ miles east of Chapman Ranch field, and about 6½ miles west of Cayo del Oso field, in Nueces County, lower Gulf Coast district, Texas.

T. G. & M. Drilling Co., Wichita Falls, Tex., will drill a 9,000-ft. test for George Graham and Emory Spencer at a wildcat location 4 miles southwest of Rockport, Aransas County, lower Texas Gulf Coast. Location is for 2 Brundette, in William S. Tutton Survey.

Allen & Morris, San Antonio, will drill Pure Oil Co.'s projected 7,500-ft. wildcat test, 1 Farm Tract 2006 Unit, 2 miles south of Mercedes field, southern Hidalgo County, in the Rio Grande Valley of Texas. Location is in Llano Grande Grant.

T-W Drilling Co. has taken a contract for another well which Interstate Natural Gas Co. will drill in the recently opened Coffee Bay field, in Lafourche Parish, coastal Louisiana. It will be the operator's 3 Grandison, projected to 12,000 ft.

Falcon Seaboard Drilling Co., Tulsa and Houston, has contracted for an 11,000-ft. test to be drilled for Amerada Petroleum Corp. at 1 Clothil Landry, in 24-11s-1e, 7 miles northwest of Kaplan, Vermilion Parish, southern Louisiana.

J. P. Owens is contractor on a 9,500-ft. test M. L. Jamison is starting on the west flank of Jennings dome, Acadia Parish, coastal Louisiana. Location is for 1 Bergeaux et al., in 45-9s-2w.

Kern-Trimble Drilling Co., Magnolia, Ark., is scheduled to drill another well for Lawton Oil Corp., also of Magnolia, in the newly discovered producing area between Wesson and Gum Creek fields, in southern Ouachita County, Arkansas. The new operation, 1-A Patterson, contracted to 4,000 ft., is a west offset to the operator's discovery well.

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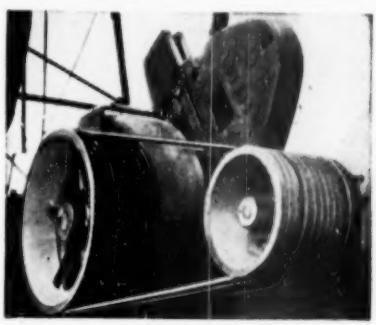

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If your V-Belts are affected by static, oil, heat, or water we suggest you consult us. We won't offer any "cure-all" belts for these conditions, but we will offer belts designed and constructed to resist oil, heat, etc. to a varying degree. You'll get much longer belt life and have fewer expensive belt replacements. So before you order that next set of belts, consult us.

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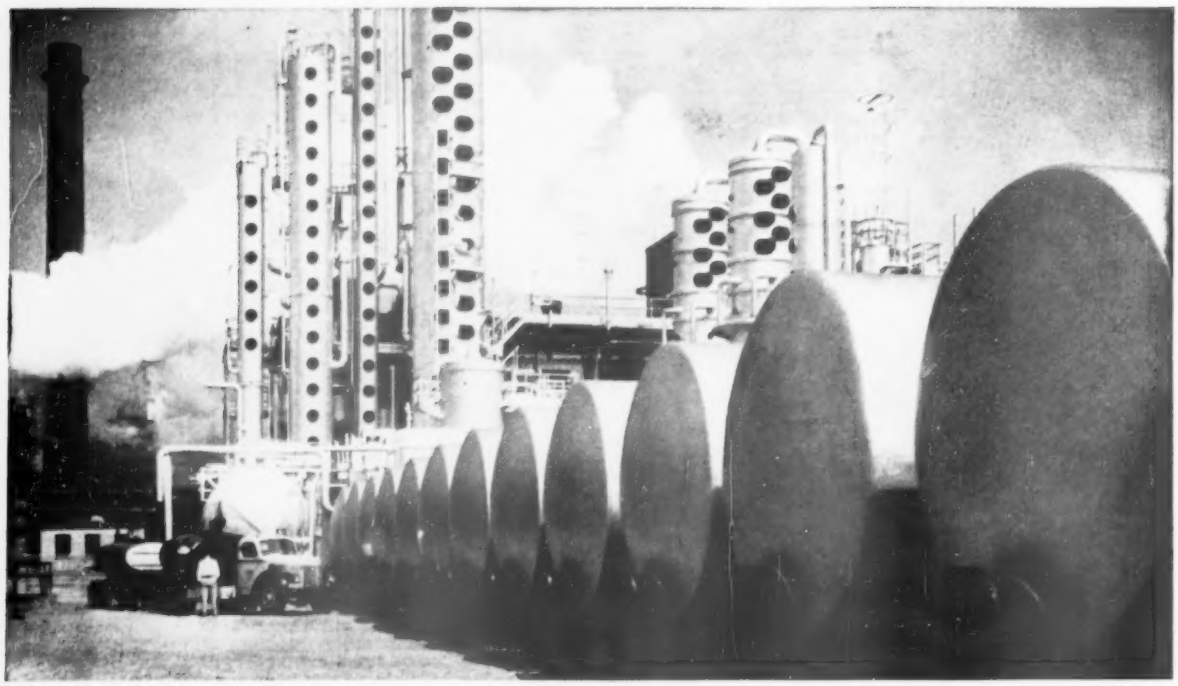
TANKS PREPARED FOR ALCOHOL STORAGE BY CHEMICAL CLEANING

Dowell Service removed all traces of oil after mechanical cleaning method failed



Can you imagine cleaning out oil storage tanks so well that they could be used to store a product such as alcohol, which is so easily discolored by oil and grease?

That's exactly what Dowell did for a customer who wanted to convert three 350,000 gallon tanks from oil to alcohol storage.

Previous attempts to clean the tanks by sand blasting had not been satisfactory. And there was particular difficulty in cleaning behind the overlapping plates of one riveted tank.

Dowell Service did the job in about 10 hours per tank - with this result: *the tanks were completely free from oil and grease.* Dowell furnished all trained personnel, chemical solvents, high pressure jets, pump trucks and controls.

Tank cleaning, including removal of paint from external surfaces, is just one of hundreds of applications for Dowell Service using chemicals for maintenance cleaning. For complete information and estimates on the cleaning of your equipment, call the nearest Dowell office, or write directly to Tulsa, Dept. A-11.

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REFINING

Smog Suit Filed

Union seeks permission to operate sulfur unit

LOS ANGELES.—Union Oil Co. has filed suit in the Los Angeles Superior Court seeking a permit which will enable it to continue operating a $500,000 sulfur-recovery unit at its Wilmington, Calif., refinery.

The complaint was directed against the Air Pollution Control District and other agencies, and contends that denial of a permit to operate the unit is equivalent to depriving Union of property.

Chief issue raised in the complaint centers on the interpretation of the District's Rule 53, which limits the quantity of sulfur compounds which may be released through any one stack to 0.2 per cent.

Waste increases . . . Prior to completion of the sulfur-recovery unit in late 1952, although approximately 20 tons of sulfur compounds were being emitted through several stacks, the waste did not exceed the set limit. For reasons beyond its control, Union stated the concentration of contaminants in gases from the single stack range between 1.3 and 1.9 per cent.

Thus while the total discharge from the single stack actually is greatly reduced from that discharged by the several stacks previously used, the company last May was refused a permit. The hearing board did grant a temporary permit under which the plant has been operating, with the understanding that Union would seek to remedy the problem.

To correct the situation, Union claims, will require installation of a $535,000 "trail" process. The company asserted that operation of the existing unit already is causing an annual $22,000 loss, and that operation of the additional equipment would cause an additional $100,000 loss yearly.

Esso Reduces Avgas TEL

NEW YORK.—Esso Export Corp.'s aviation department has announced that Esso refineries in the United States and Caribbean areas will reduce the lead content of grades 91/98 and 100/130 aviation gasoline to a maximum of 3 cc. per U. S. gallon.

The move follows the October 1 cancellation of Petroleum Administration for Defense Order No. 4, which required refiners to use a minimum of 4.6 cc. of tetraethyl lead per gallon for all aviation gasolines exported from the U. S.

The lower TEL content fuel, preferred by airlines as permitting reductions in engine maintenance, will be available to Esso marketing affiliates at airports in North and South America, Europe, North Africa, and along the North and South Atlantic air routes.

NELSON REFINERY CONSTRUCTION INDEX

Appears in the first issue each month.
Explanation—"News Items That Appear in Quarterly Cost Indexes," July 7, 1952, pages 105 and 106.
Compiled by W. L. Nelson—Petroleum Refinery Consultant—Tulsa.
Indexes of Individual Equipment Items—January, April, July and October.

Index (1946 = 100)

	1948	1949	1950	1951	1952	Sept. 1953
Pumps, compressors, etc.	127.0	135.9	138.2	155.9	155.6	166.8
Electrical machinery	127.6	130.9	134.9	154.3	152.4	159.9
Internal combustion engines	116.9	124.8	126.0	146.1	146.5	150.2
Instruments	120.0	†123.1	127.8	142.3	146.2	156.3
Heat exchangers	130.0	133.0	140.0	152.0	165.8	179.8
Miscellaneous equipment average	*122.1	*121.6	*126.2	*145.1	153.3	162.6
Materials component	139.3	143.6	149.5	164.0	164.3	176.5
Labor component	128.0	137.1	144.0	152.5	163.1	178.4
Refinery Construction Index	132.5	139.7	146.2	157.2	163.6	177.6

*Used in computing the Nelson Index until April 1952. These are slightly different than the average of the miscellaneous equipment items shown above. †Corrected value.

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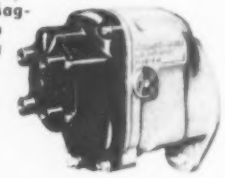
To Keep Your Pumping Engines Running

Fairbanks-Morse Super Spark Magnetos are famous for their advanced design and superior construction. Years of service in the oilfields have proven Fairbanks-Morse Super Spark Magnetos have the stamina to do the job under the toughest conditions. They are ruggedly constructed with relatively few parts—rarely need maintenance—costly ignition failures are eliminated.

Ball bearing supported one piece Magnetic rotors—oversize high tension coils—large long lasting breaker points and powerful Alnico magnets are just a few of the features that make Super Spark Magnetos superior.

Switch to Super Spark Magnetos today. See your Fairbanks-Morse service station or distributor or write Fairbanks, Morse & Co., Magneto Division, Beloit, Wisconsin.



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Pure zinc or aluminum, molten-sprayed on iron or steel surfaces, provides complete, dependable protection against atmospheric corrosion for upwards of 20 years without further maintenance. Such coatings are *mechanically* bonded to the surface—adhesion is *not* dependent on volatile vehicles or binders. Scaling, crazing, blisters, are eliminated. Protection is positive. "Metallize 'em and forget 'em!"

Why not find out more about how you can forget rust for 20 years or more? For descriptive Bulletin 62B—or the name of your nearest Metco Systems contractor—write or wire.

**Reg. U.S. Pat. Off.*

the Metco* Systems

—a series of 18 basic engineering specifications developed over 19 years of experience with pure zinc and aluminum coatings on many different types of structures and equipment. The *Metco Systems* provide for standardization of surface preparation, metal coating thicknesses and organic aftercoatings for various service conditions and appearance requirements.

Metco Systems Dept. G, 38-14 30th Street Long Island City 1, New York

Petrochemicals

Coke-Oven Benzol Again Being Blended in Motor Fuel

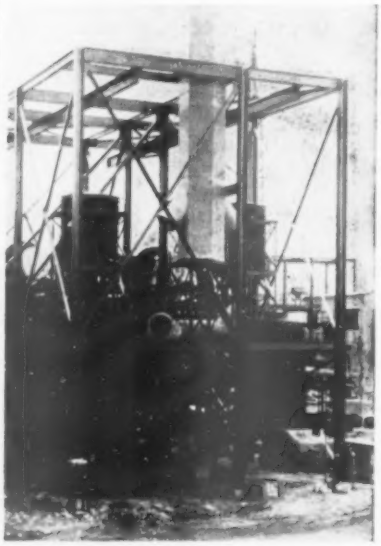
NEW YORK.—Coke-oven benzol is being blended into motor fuel again for the first time since World War II.

A recent reduction of 2 cents per gallon has brought the price down to 40 cents per gallon at some major eastern supply points.

This is 10 to 15 cents lower than the price of petroleum-derived benzene, much of which is contracted at 50 to 55 cents per gallon for periods of 3 to 5 years. Recent reductions in government purchases of toluene have eased the supply of this basic aromatic chemical.

Incomplete reports on 1953 production of benzene indicate that over 19 per cent of the year's production will come from petroleum refiners, while coke-oven operators will supply about 65 per cent and the remainder will come from tar distillers. A 65 per cent increase in 1953 production of petroleum benzene is in prospect, as compared with 1952.

The end of the year saw most of the catalytic reforming units designed for aromatics production in operation, with a few still to be completed.



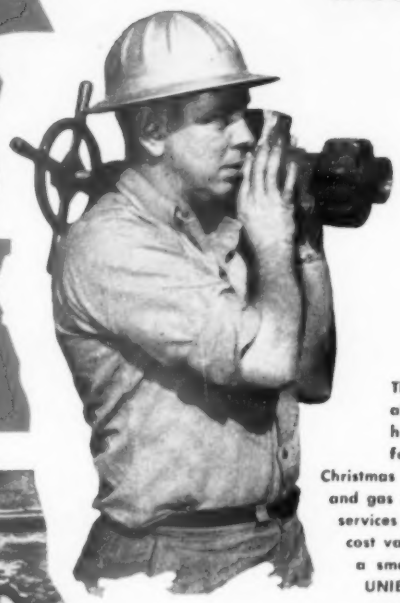
New Laminate Developed

A special fiberglas reinforced polyester laminate, called Iolyte, has been developed by Schori Process Division of Ferro-Co. Corp., Long Island City, N. Y., for use in the manufacture of concentrator stacks, chemical exhaust systems, filtrate troughs, and chemical production equipment. Shown here is a section of a 32-ft. concentrator stack made of the special laminate ready for shipment to a southern chemical plant. The stack was constructed for hydrofluoric acid fumes.

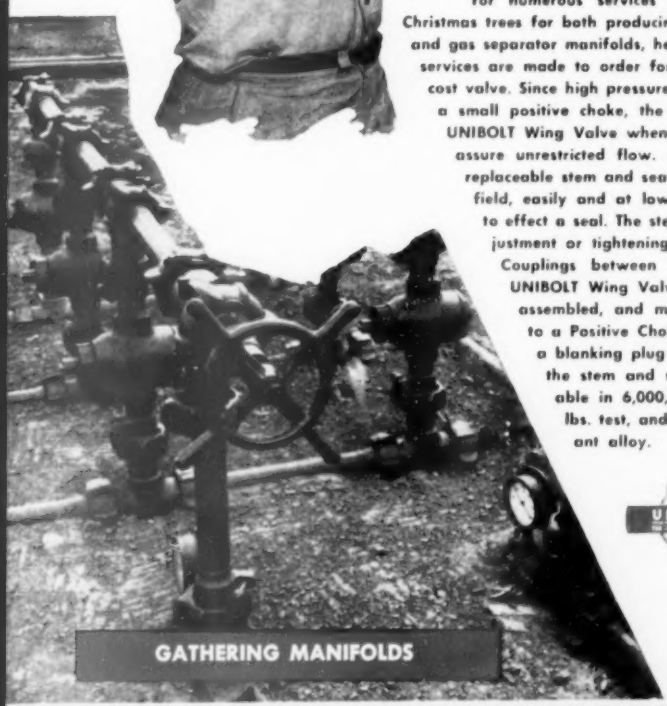
wherever flow control is important

UNIBOLT

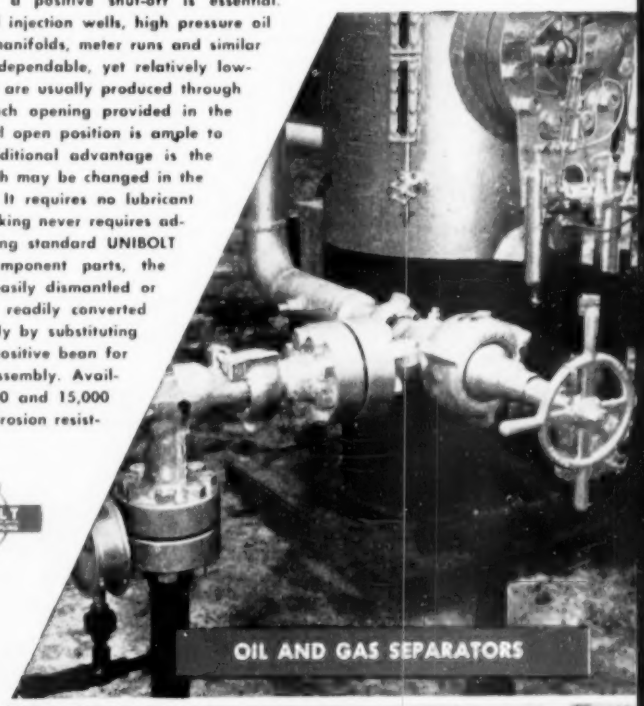
adjustable wing valves are your best bet !



The UNIBOLT Wing Valve, designed originally for use as an adjustable choke where well conditions did not demand a positive choke, has become popular with production men as a dependable valve for numerous services where a positive shut-off is essential. Christmas trees for both producing and injection wells, high pressure oil and gas separator manifolds, heater manifolds, meter runs and similar services are made to order for this dependable, yet relatively low-cost valve. Since high pressure wells are usually produced through a small positive choke, the one-inch opening provided in the UNIBOLT Wing Valve when in full open position is ample to assure unrestricted flow. An additional advantage is the replaceable stem and seat, which may be changed in the field, easily and at low cost. It requires no lubricant to effect a seal. The stem packing never requires adjustment or tightening. Having standard UNIBOLT Couplings between its component parts, the UNIBOLT Wing Valve is easily dismantled or assembled, and may be readily converted to a Positive Choke Body by substituting a blanking plug and positive bean for the stem and seat assembly. Available in 6,000, 10,000 and 15,000 lbs. test, and in corrosion resistant alloy.

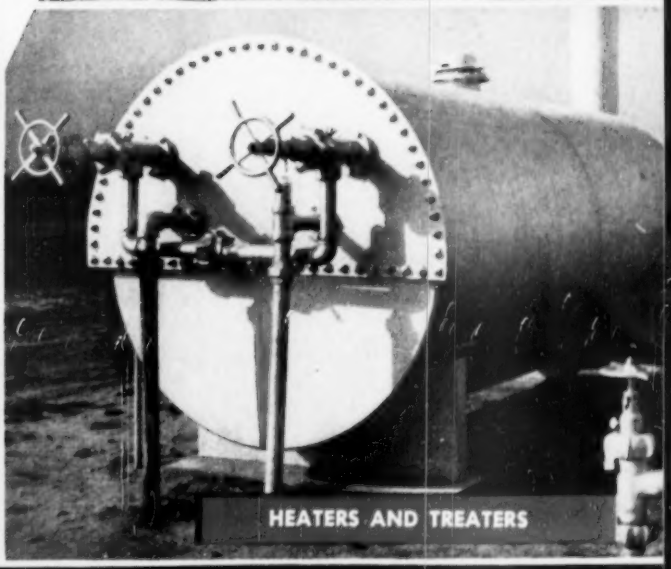


GATHERING MANIFOLDS



OIL AND GAS SEPARATORS

CHRISTMAS TREE FLOW MANIFOLDS



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PIPE LINES

Gas to Great Lakes

FPC approval sought for huge pipe-line program

WASHINGTON.—Federal Power Commission permission to carry out a $168,462,035 pipe-line construction program designed to supply Great Lakes consumers with natural gas is being sought by four companies.

The applicants are American Louisiana Pipe Line Co., Michigan-Wisconsin Pipe Line Co., Michigan Consolidated Gas Co., all of Detroit and subsidiaries of American Natural Gas Co., and Texas Gas Transmission Co.

Biggest project . . . American Louisiana, a newly formed company, has the largest project which includes a 1,289-mile, 30-in. transmission system from Lowry, La., in Acadia Parish to a point near Detroit. Engineering for this $130,000,000 system, which will have an ultimate capacity of 300,000,000 cu. ft. daily, has been completed.

Gas supply . . . American Louisiana will get most of its gas from southern Louisiana fields, but Texas Gas plans to supply it with 51,000,000 cu. ft. daily through a connection near Slaughters, Ky. To accomplish this, Texas Gas is asking the FPC to permit laying of 48 miles of loop lines along an existing transmission system between Memphis and Slaughters. Also, the company proposes to add compressor facilities at one of its stations located between the two cities.

The entire project will cost about $4,281,135. The transmission system consists of two parallel 26-in. lines running from Bastrop, La., to Slaughters *(The Oil and Gas Journal, November 23, page 137)*.

Other projects . . . When the gas reaches the Detroit area, it will enter Michigan-Wisconsin's system for further distribution. In order to carry out this project, the company plans to expand its system in the Great Lakes area. Presently Michigan-Wisconsin is supplying 16 distribution firms in the region, one of which is Michigan Con-

Reliable and fast pipealigning!

CROSE INTERNAL LINE-UP CLAMPS

This popular hand-operated internal lineup clamp is designed to give trouble-free operation under all operating conditions. You get perfect alignment and continuous uninterrupted stringer bead that eliminates pinholes and weak welds due to tacking. Costly stringer bead cut-outs due to misalignment are eliminated. Made in 10 sizes for pipe from 12" to 36".

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Oil Moving Through Biggest U. S. Crude Line

Oil was slated to reach Sarnia, Ont., last week through Lakehead Pipe Line Co.'s 645-mile, 30-in. line from Superior, Wis.—the largest-diameter crude carrier in the United States and part of the world's longest continuous crude-oil main line. The Lakehead trunk actually is an extension of the system of Interprovincial Pipe Line Co., its Canadian parent. The line now stretches 1,765 miles from Alberta fields to Sarnia refineries. Initial deliveries will be at a rate of 100,000 bbl. daily (The Oil and Gas Journal, December 28, page 53). Completion of the Lakehead extension permits steady year-long deliveries of crude at Sarnia—formerly impossible because icing of the Great Lakes bottled up tankers during the winter. Here a welding crew makes tiein weld in huge 30-in. pipe during final stages of construction at Vanderbilt Road near Wolverine on the extreme northern end of Michigan's lower peninsula.

. . . Skill

In every phase of pipe line construction is an important factor in Houston Contracting's facilities.

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General Contractors
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solidated, through a gas line from the Texas and Oklahoma panhandles. However, this facility has become inadequate in recent years to meet rising demands.

Michigan Consolidated also plans to expand its existing pipe-line facilities in order to handle the additional gas supply. In addition, the firm has been doubling the capacity of its underground-storage facilities in anticipation of receiving more gas. The southern Michigan storage projects now can hold 110 billion cubic feet of gas, which will enable the Texas line and the proposed Louisiana line to operate at full capacity throughout the summer months *(The Oil and Gas Journal, July 27, page 211).*

Texas Eastern Plans Storage Service, 265-Mile Gas Line

SHREVEPORT.—Texas Eastern Transmission Corp. and a wholly owned subsidiary have filed applications with the Federal Power Commission seeking permission to carry out a "gas-storage service" for Transcontinental Gas Pipe Line Corp. and to construct a 265-mile pipe-line system.

Texas Eastern plans to store 12 billion cubic feet of gas per year for Transcontinental and deliver the gas in the winter to the latter firm at the rate of 133,500,000 cu. ft. per day.

The gas will be stored in Texas Eastern's Oakford, Pa., storage project and delivered to Transcontinental near Lambertsville, N. J. The gas will be used by Transcontinental to increase deliveries to customers in Pennsylvania, New Jersey, and New York. Under the plan customer companies will purchase summer gas already contracted to them by Transcontinental under existing agreements, and these companies will make the gas available for summer delivery into storage by Texas Eastern.

In order to carry out this plan, Texas Eastern Penn-Jersey Transmission Corp., Texas Eastern's subsidiary, plans to construct a 265-mile, 24-in. gas line from the Oakford storage project to its parent company's compressor station No. 26 near Lambertsville. Also, the applicant plans to construct a 3,300-hp. compressor station near the storage field plus other necessary installation and measuring facilities on the proposed system. When the $31,000,000 project is completed, it will be leased to and operated by Texas Eastern.

Part of Transcontinental's plans to increase deliveries to the New York-New Jersey-Pennsylvania area call for looping 533 miles of its Texas-New York transmission system. Half of the operation calls for 36-in. loops from

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Valve operation should be easy, and it can be if you use DESCO LUBRICANTS and a DELTA GUN . . . and they make the matter of plug valve lubrication easy too!

WHY DESCO LUBRICANTS ARE BETTER!
DESCO LUBRICANTS are chemical compounds and not just plain greases. Each one is compounded to do a particular job and do it well. No fillers are used. No inert material. That's why there is no coking, no "hardening of the arteries." It also explains why DESCO retains all its lubricating qualities, and does not bleed or deteriorate in storage.

ONLY 4 DESCO LUBRICANTS HANDLE ALL VALVE SERVICES
That's right, only 4 DESCO LUBRICANTS will handle all the lubricated plug valves you have, no matter what their service—hydrocarbon, acid, caustic or LPG. Think what this means in reduced warehouse stocks and the possibility of using the wrong lubricant.

CONVENIENT STICKS OR BULK

Packed in clean, convenient sticks to fit Delta Gun, or in smaller sticks for jack screw lubrication, or in drums for volume lubricators.

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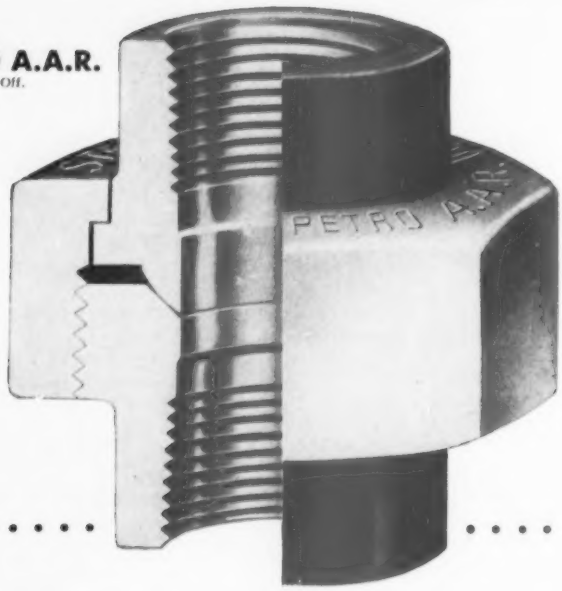

"PETRO A.A.R." Hot Forged of A.I.S.I. 1023 Open Hearth "Killed" Steel—For temperatures from 100° below zero F. to 1000° above zero F. A differential of 40 points (brinell) in hardness is maintained between the male and female seats to prevent seizure of seats at high temperatures.

Nut threads are permanently lubricated with Udylite Cadmium (plated). "PETRO A.A.R." screwed and "PETRO A.A.R." Socketweld are recommended for severe service on ammonia, air, gas, oil, steam, and water, and for general industrial and oil refinery maintenance.

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FORGED STEEL "ORIFICE" UNIONS, SCREWED, OR SOCKET WELD

For flow control of steam, oil, ammonia, chemicals, water, gas, and air. Also for metering and measuring.
Recommended for working pressures of 600 lbs. at 900° F., or 3000 lbs. at 150° F.
Furnished with Type 304 stainless steel orifice plate and steel-jacketed asbestos filled gaskets.
The orifice plate and gaskets are set in a groove of solid steel to facilitate ease of tightening and safeguard against blowing of gaskets and resultant trouble.
Nut threads of the union are Cadmium plated (Udylited) for permanent thread lubrication.

Sizes ¼" Thru 3"

For additional information about these and other Forged Steel Unions write Department O, for Illustrated Catalog or refer to listings in Composite Catalog pages 3194-3195, Refinery Catalog page 695 and Chemical Engineering Catalog pages 1294-1295.

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the Gulf Coast to the Piedmont Plateau markets in North and South Carolina, and the remainder of the project to consist of 30-in. loops *(The Oil and Gas Journal, December 7, page 159)*.

Subsidy Sought

Texas-California crude line asks federal aid

WASHINGTON.—Federal guarantee of a private loan for construction of a proposed 1,000-mile crude-oil system from West Texas to the Los Angeles area is being sought by L. M. Glasco of Dallas, president of West Coast Pipe Line Co.

In an application addressed to the Treasury Department, Office of Defense Mobilization, and Petroleum Administration for Defense, Glasco pointed out that the proposed 24 and 26-in. system would have to transport a minimum of 75,000 bbl. daily to break even. He asked the Treasury to make up any deficit if the deliveries were under 75,000 bbl.

Glasco expects the line to initially carry 175,000 bbl. of crude daily even though contracts from shippers have not been forthcoming in adequate volume.

Financing . . . Glasco stated in the application that ultimate cost of the line will be $106,000,000 with $21,500,000 coming from equity capital. The sale of bonds to insurance companies and others by White, Weld & Co., New York, will produce $85,000,000, according to Glasco.

Prior to submitting the application, Glasco conferred with Government officials on the feasibility of building the line. He testified recently before a Senate Interior subcommittee that the line was needed because this country could not depend upon Canada to supplement petroleum supplies. "The Canadian civilian economy requires approximately 500,000 bbl. per day, and the total Canadian production of crude oil remains at around 260,000 bbl.," he told the group *(The Oil and Gas Journal, December 14, page 181)*.

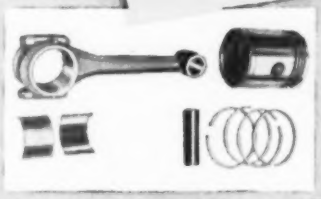
Nevada Gas Line Finished

LAS VEGAS.—A 114-mile 10¾-in. gas line from Topock, Ariz., to a point near here has been completed for Nevada Gas Pipe Line Co. by R. H. Fulton Co.

The $2,500,000 line connects with El Paso Natural Gas Co.'s system at Topock and runs northeastward to Las Vegas. Construction was started in early November.

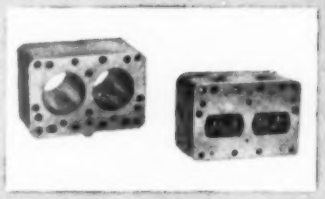
STANDARDIZED PARTS ON POWER UNITS assure longer lower cost Oilfield Service!

MINNEAPOLIS MOLINE MM OILFIELD POWER

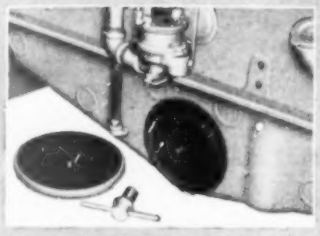


Connecting rods are drilled and have precision shell bearing inserts. Pistons are assembled in matched sets

Crankshafts and camshafts are of heavy section design, extra-large bearing area



Removable cylinder blocks and heads are cast in pairs separate from crankcase



Water jacketed base pan with built-in oil filter means longer service

10 YEARS OF CONTINUOUS OPERATION, 86,359 HOURS UNDER LOAD WITHOUT REPAIRS! That's the record of an MM Power Unit for its California owner (name on request). More important are these facts which were attested to when the unit was dismantled and moved to another location: Crankshaft journals were smooth and showed a maximum wear of .0008; connecting rod journals showed maximum wear of .0005; main bearing shells had worn .001 or less and cylinders miked within .0028 *thru entire bore!*

There's a proud record and here's the reason: Standardized parts on MM Power Units make possible the very finest machine tooling, consequent closer tolerances and greater precision in production. That's your assurance that *MM means more for your money . . . better parts for lower cost at those infrequent times when even an MM needs servicing!*

Standardize on MM for lower-cost interchangeability that requires smaller spare part stocks.

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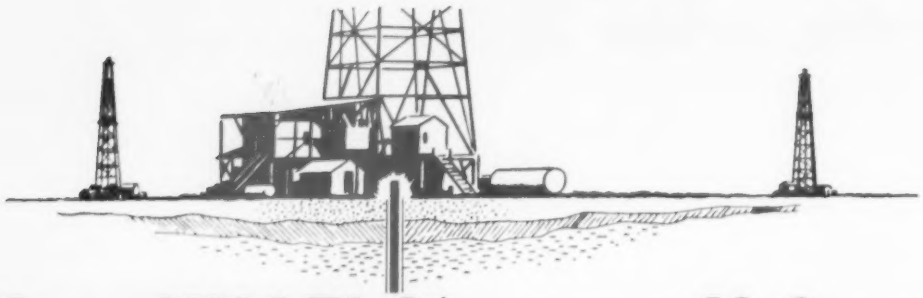

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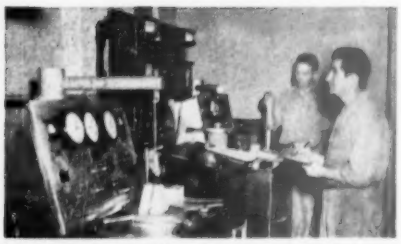

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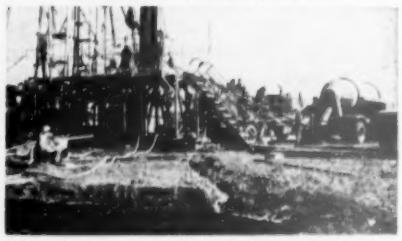

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EXPLORATION

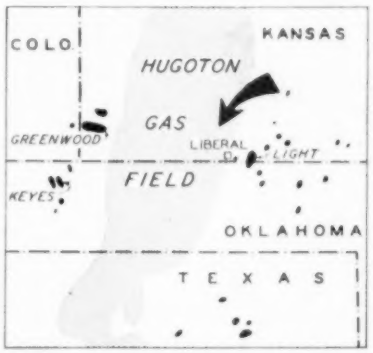
New Gas Pays for Hugoton Field

by Joseph A. Kornfeld

DISCOVERY last week of commercial natural-gas production from Pennsylvanian limestones in Seward County, Kansas, beneath the 2,000,000-acre nine-county Hugoton, Kans., gas field adds an important new gas objective. Topeka limestone of Pennsylvanian age, the new reservoir lies about 1,450-ft. beneath the principal Permian pay levels found at 2,750 ft.

Although Pennsylvanian limestones have been found earlier in southwestern Kansas in Greenwood gas field in Morton County, the new Topeka limestone discovery marks the first Pennsylvanian gas reservoir to be found to date beneath the Permian reservoir limits of the Hugoton, Kans., field.

The discovery well—Cities Service Oil Co. "B"-1 Holt, C NW NE 28-32s-34w, last week tested 17.7 M.M.c.f. of gas per day on open-flow test through casing perforations from 4,184 to 4,200 ft. in lower Topeka limestone. As shown by arrow on the map the well is situated 16 miles northwest of Liberal and about 20 miles north of the Oklahoma-Kansas state boundary line.



DEEP GAS STRIKE beneath Permian producing limits of Hugoton gas field is shown by arrow which points to Pennsylvanian strike near Liberal, Kans.

Permian Gas Review

Past development at Hugoton, Kans., field has been in the Permian rocks. Permian gas reservoirs are porous limestones and sandy limestones found in the Herington, Krider, and Winfield members of the Big Blue group.[1] Permian gas production has been proved beneath 1,956,938 attributable acres on which there have been completed 3,082 presently producing gas wells drilled principally on 640-acre spacing.

Reserves . . . Since 1929, more than 2 trillion cubic feet of Permian gas has been produced from the Kansas side of the tristate Hugoton gas field. Remaining recoverable natural-gas reserve including undeveloped acreage from the Kansas portion is estimated at 13 trillion cubic feet (to abandonment pressure of 75 psi.)

Deliverability . . . Adjusted deliverability from the Hugoton, Kans., Permian gas reservoirs was 4.76 billion cubic feet per day according to the December 1953 report of the conservation division of the Kansas State Corporation Commission. One engineering source states that this is near the predicted peak deliverability from the Permian reservoirs. Hence, discovery of deeper gas from the Pennsylvanian rocks beneath Hugoton field is certain to bolster present deliverability.

Pennsylvanian Prospects

Principal developed gas accumulatons found in deeper reservoirs in southwestern Kansas are found on eroded, structural terraces in the Pennsylvanian Morrowan and Mississippian Chester limestones. However, Pennsylvanian limestones have been draped over Pennsylvanian Marmaton reef buildups, e.g. Novinger in Meade County,[2] while to the north, anticlines are known from the subsurface in Scott, Finney, and other counties.

Reflection seismograph will be employed in mapping Pennsylvanian closures beneath Permian draped sediments in Hugoton field proper. These deeper structures are generally reflected as terraces in the Herington, Krider, and Winfield limestones, and are too deep for core drilling.

Additional development will be required to ascertain the mode of accumulation in the Pennsylvanian Topeka limestone around the Holt well. Greenwood gas field, discovered by seismograph, already covers 22,400 attributable acres from 50 completed gas wells in Topeka-Lansing limestones and 3 gas wells in Morrow sand.[3]

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1. Garlough, John L. and Garvin L. Taylor, "Hugoton Gas Field, Grant, Haskell, Morton, Stevens and Seward counties, Kansas, and Texas County, Oklahoma." Stratigraphic Type Oil Fields, A Symposium, A.A.P.G. (1940) pp. 78-104.

2. Kornfeld, Joseph A., "Novinger Field Drilling Paces Search for Marmaton Bioherms," The Oil and Gas Journal, Vol. 52 No. 23, October 12, 1953, p. 198.

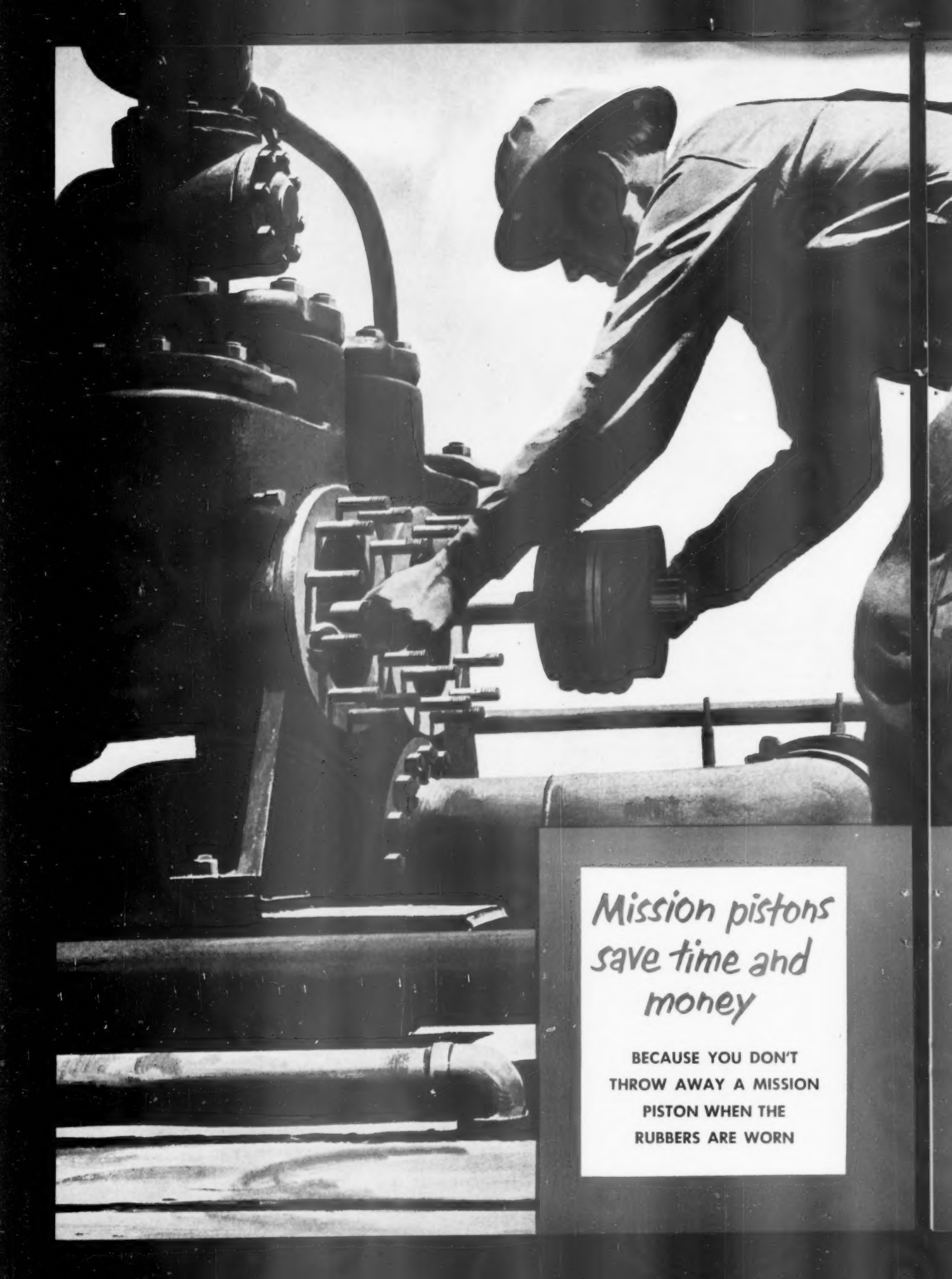
3. McCaslin, J. C., "Kansas Operators Making Hole at Record Rate This Year," The Oil and Gas Journal, Vol. 52, No. 22, October 5, 1953, p. 330.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

KANSAS . . . Vast Hugoton gas field in southwestern Kansas has a new pay, the lower Topeka limestone of Pennsylvanian age. The important new gas discovery is Cities Service Oil Co. 1 Holt "B," C NW NE 28-32s-34w, Seward County. It flowed at the rate of 17,700 M.c.f. of gas per day. Nearest production from this new zone is in the Greenwood gas area, 45 miles west. Production is from a depth of 4,200 ft.

WYOMING . . . Two important new pays were opened up in Beaver Creek field and in the Dickie unit. The new pay in Beaver Creek field, Fremont County, is the Madison at Stanolind Oil & Gas Co. 30-M, S½ NW NE 10-33n-96w. Stanolind 2 Unit, NE NE NE 26-45n-101w, Dickie unit, is a Tensleep discovery. Previous production in Beaver Creek field was from the Frontier, Muddy, Cloverly, Mesaverde, and Tensleep.

WEST TEXAS . . . Continental Oil Co. has an Ellenburger discovery at a deep operation in Wemac Wolfcamp pool in Andrews County. The well flowed 63 bbl. of 50°-gravity oil in 1 hour on drill-stem test at 13,259-13,329 ft. Nearest Ellenburger production is 4½ miles southwest in the Northeast Midland Farms area.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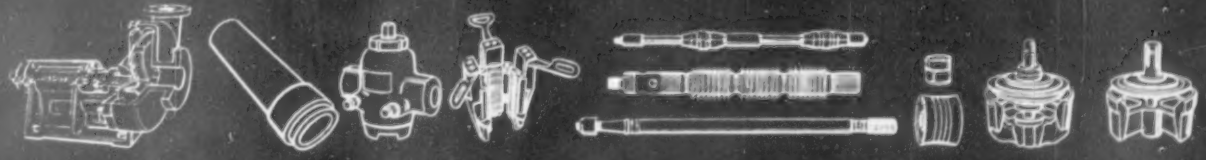

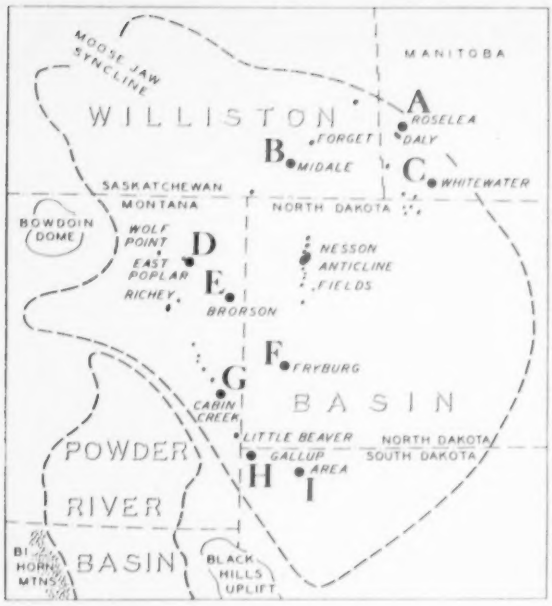

Letters on map denote areas of most significant development in the Williston basin in 1953. The newest producing basin under Rocky Mountain jurisdiction is producing nearly 20,000 bbl. of oil per day from six fields in North Dakota and six in Montana, excluding the Canadian Williston fields. The basin covers 120,000 sq. miles, and its limits are somewhat arbitrary. The only obvious limiting features are the Black Hills in South Dakota and the Bowdoin dome in Montana. The basin, although considered as a Rocky Mountain basin, lies within the Great Plains physiographic province.

Williston Finds 1953 a Year Of Steady Development

North Dakota completions up 120 per cent

by John C. McCaslin

THE Williston basin, newest producing basin in the Rocky Mountain province, enjoyed a very profitable year in 1953 from the standpoint of new discoveries, production, and development of the area's new fields.

Completions in the North Dakota portion of the basin showed a marked increase over 1952, up 120 per cent. Operators finaled nine new oil discoveries in the state last year. Total wildcats drilled in the Dakotas in 1953 were up 135 per cent over the previous year.

The most significant discovery in North Dakota last year was Amerada Petroleum Corp.'s Fryburg strike in Billings County. Montana's big hit of the year was at Sun Oil Co.-Phillips Petroleum Co. 1 Dynneson in Richland County, the state's deepest producer and deepest hole. The importance of these two strikes somewhat overshadowed the basin's other advances last year. Manitoba reported three new Mississippian strikes in 1953, while Saskatchewan tallied three new pools.

North Dakota

Fryburg find . . . The Fryburg discovery in Billings County (F on map) was completed by Amerada at 1 May for a gage of 217 bbl. of oil per day through 18/64-in. choke.

The well is the first in North Dakota of any significance to be completed outside the Nesson anticline area. It is 50 miles from other production, and is located in the deeper portion of the basin. The strike was made on an isolated seismic prospect. The Fryburg well will help assure drilling of other seismic highs known to have been mapped in the deeper portions of the basin. Its success helps discourage the idea that big oil accumulations in the basin are restricted to the three regional structures . . . Nesson, Cedar Creek, and Poplar anticlines.

The 1 May has been confirmed by Amerada's 1 Logan, ¼ mile to the northwest. The confirmation test was completed flowing 207 bbl. of 42°-gravity oil per day and 54 bbl. of water on 22/64-in. choke. A third well is under way ½ mile southeast of the discovery well. The outcome of this third well in the new producing area will have great influence on the future of Fryburg pool and the deeper portion of the basin.

The Fryburg confirmation well was the first in North Dakota to recover oil from the Heath sand, the youngest formation of the Mississipian - Big Snowy group. A drill-stem test recovered 1,200 ft. of oil, but the sand was only 15 ft. thick. The Heath's thickness is variable in the Beaver Lodge area, so it is entirely possible that the formation may prove commercial in the Fryburg area after further drilling. Nearest Heath sand production is in central Montana in the Sumatra area. Some Heath oil was recovered at East Poplar field, Montana. The only other sand in the basin found to be oil-bearing was the Triassic-Spearfish in Bottineau County, North Dakota, where it overlies the beveled edges of the Mississippian limestone, which is the basin's leading producer.

In December the third well in the Fryburg area reported recovery of 2,114 ft. of black oil on drill-stem test of the Heath, the second well in this pool to find Heath possibilities. The well is 1 mile southeast of the second well drilled in the area, the confirmation test, which found Heath shows but was completed in the Madison.

Stanolind Oil & Gas Co. has its first North Dakota success at 1 Star in McKenzie County. The discovery flowed 551 bbl. of oil per day on 12/64-in. choke from perforations at 10,526-56 ft. in the Three Forks member of the Devonian. The well was not acidized, as has been the general practice in the area, but was fractured. This is the first use of this process in western North Dakota. A considerable amount of fracturing has been done in other Rocky Mountain areas, particularly in Wyoming with results generally good. The apparent discovery, which is 12 miles east of previous production, is shut in for storage. The 1 Star is the state's deepest producer. Amerada also has a Devonian-Jefferson discovery in Beaver Lodge field at 2 Kvam. This well is the state's deepest hole. A McKenzie County extension to the producing area in Charlson field flowed 382 bbl. of oil on a 16-hour test in the Madison. The gage was the best to date on the southern part of the Nesson anticline.

Montana

Brorson area . . . Sun Oil Co.-Phillips Petroleum Co. made the most significant strike in Montana's portion of the Williston basin last year at 1 Dynneson (E on map.)

The discovery, which was completed

flowing 745 bbl. of oil per day through 20/64-in. choke from the Ordovician-Red River, was the first to show for production in the central part of the basin between the Baker-Glendive anticline and the Nesson anticline. The strike was finaled flowing from perforations at 12,585-12,605 ft. Total depth is 12,671 ft., making it the deepest hole in Montana, and also the deepest producer in the state. It was the first test of a seismic prospect away from a known surface structure in the basin to give commercial production. The second such strike was the North Dakota Fryburg discovery. A second well is drilling in the Brorson area, which is 45 miles east of Richey production and 71 miles southwest of Beaver Lodge field in North Dakota.

Cabin Creek . . . The year's first important hit in Montana was at Cabin Creek in Fallon County on the southern part of the Baker-Glendive anticline (G on map).

The discovery was the first to recover a significant amount of oil from the Mississippian on the anticline. Cabin Creek is about 15 miles southeast of Pine Unit, which produces from the Devonian and Ordovician, and is northwest of Little Beaver pool, also an Ordovician producer. The confirmation test to the discovery is testing and is being watched with considerable interest, and is of importance to eastern Montana operations since the discovery well was rated by Shell as capable of 4,235 bbl. of oil per day from two zones only, with shows in Charles and Madison not tested. Production at the Cabin Creek discovery well was from Silurian and Ordovician. Drill-stem tests in the Madison and Devonian indicated commercial production, but no attempt was made to test these zones after casing was run.

East Poplar field area . . . Empire State Oil Co. completed a recovery of 180 bbl. of oil per hour on test of two Madison zones at 3 Cornejo, north of East Poplar field in Roosevelt County (D on map), which is the state's most active Williston development area.

The well is an extension of the operator's recent big Madison strike in the area which was reported as a 6,000-bbl. per day producer. The wells are both structurally lower than East Poplar's other wells. The year 1953 saw many good completions in this area.

The latest indicated strike in Montana of importance to future drilling in the area of the Williston basin which lies between the Nesson anticline and the Cedar Creek anticline is Lion Oil Co. 1 Knight in the Wibaux area of Wilbaux County.

Recovery of Madison oil was reported late in December at this scheduled 11,500-ft. Cambrian test. The wildcat lies about midway between North Dakota's significant Fryburg pool and the Cedar Creek anticline. This general area of the basin took first place in late 1953 news. Gulf Oil Corp. recovered some oil at its Trotters area wildcat in Golden Valley, North Dakota, and 21 miles southwest of the Gulf test Blackwood & Nichols have an important wildcat drilling. The three wells lie on a trend running from Fryburg to East Poplar field through Richland County, Montana's Brorson area.

South Dakota

Shell Oil Co. recovered free oil and highly oil and gas-cut water on tests of the 1 State "A" in the Custer area of Harding County, for what appears to be the first oil possibility in South Dakota.

The testing was done in the Red River (Ordovician). Shell is swabbing intermittently with recovery of varying amounts of oil and water. The wildcat is on a seismic prospect in the Custer area, about 30 miles southeast of production in the Ordovician at Little Beaver field, Fallon County, Montana, and is about 75 miles south of North Dakota production at Fryburg.

Considerable wildcat activity has been carried on in the state since the North Dakota oil discovery in 1951, but with little success. The apparent Harding County strike is about 6 miles northeast of a recent Carter Oil Co. wildcat which had slight shows in the Red River. Some shows in the Madison were also reported at the Shell prospect.

Manitoba-Saskatchewan

Last August Manitoba received its first 1953 discovery on the shallow east rim of the Williston basin. McIvor Drilling Co., Ltd., et al. 1 Roselea (A on map), 8 miles northeast of the 42-well Daly field, was completed for 118 bbl. of 35°-gravity oil per day on a ¼-in. choke in the Mississippian at about 2,100 ft. This is the first flowing well in the province. Activity in this area has continued at a high pitch. Recently an excellent producer was completed at British-American Oil Co. and Union Oil Co. of California 5-27 Grose, the southeast offset to the Roselea discovery. The well has a daily estimated flow rate of 2,505 bbl. of oil from the Mississippian.

Standard Oil Co. of California 12-16 Whitewater (C on map) was Manitoba's second 1953 strike. The discovery pumped about 75 bbl. of 34°-gravity oil per day from the Lodgepole at 2,510-39 ft. The small discovery is located southeast of Daly and 14 miles north of the North Dakota line. The Lodgepole is the basal formation of the Madison group. It underlies the Mission Canyon which has yielded most Mississippian production in the basin to date.

The third new Mississippian strike in Manitoba in 1953 came late in the year at The California Standard Co.'s Scallion wildcat, 2½ miles northeast of Roselea oil field, and 3½ miles north of Virden. Drill-stem tests gave promise of a successful discovery. This was the second discovery for Cal Standard in Manitoba in 1953. The company opened the province's first commercial oil production in January 1951, and since that time has continued an extensive exploration and development program.

Saskatchewan . . . (B on map) Three new pools were opened in this province last year, Forget, Midale, and Moose, all Mississippian producers.

The newest area, Moose, was recently opened by Williston Oil & Gas Co. at 1-19 Bobjo, 3 miles north of Forget field. The discovery found 40 ft. of Mississippian pay with no water. The well pumped 125 bbl. of 28°-gravity oil per day from the Mission Canyon at 3,951-88 ft. A west offset was completed dry, and the new area is believed to be separate from Forget.

ILLINOIS

Clay County has a discovery well at Sanders & Fye Drilling Co. 1 Berlin, NE SE NW 10-3n-7e, 4 miles northeast of Flora. The well gassed in 2 minutes and flowed clean oil in 4 minutes, no water, on drill-stem test at 2,931-46 ft. in the Rosiclare lime. Bottom-hole pressure was 1,125 psi. The Rosiclare is a new pay for Cypress pool.

APPALACHIAN AREA

OHIO

A wildcat on Frank Kreager, Lot 7, Madison Township, Licking County, started for the Clinton by Waverly Oil Works, found a gas pay in the Newburg at 2,127-2,130 ft. The gas gaged 900,000 cu. ft. and the test will be tubed at that depth.

C. H. & D. Co. 1 (2) C. M. Cochran, Section 27, Hopewell Township, Perry County, confirms another of the small pools found in this area. Clinton at 2,957-2,995 ft. was fractured and made 50 bbl. oil and 400,000 cu. ft. of gas in 24 hours.

Two wells were added to Mount Zion pool in Jackson Township, Knox County. Wray Drilling Co. 6 Margaret Melick, Section 23, logged Clinton at 3,041-3,098 ft. with a good showing natural and 175 bbl. in 24 hours after fracturing. Mid East Co. 4 Rusk, Section 24, fractured sand found at 2,855-2,904 ft. and made 215 bbl. in 24 hours.

WEST VIRGINIA

In Morgan district, Monongalia County, West Virginia, Hope Natural Gas Co. 9745 Rosa B. Wolfe, deep wildcat, elevation 1,648

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ft., is dry and preparations are being made to plug and abandon. This well encountered only a show of gas in the chert at 7,358 ft., which was topped at 7,277 ft. Salt beds were encountered at 8,380-8,410 ft., 8,427-8,480 ft., and at 8,502 ft., completing at 8,508 ft.

CALIFORNIA

Colusa County Given New Gas Field

Following the successful completion of 1 Southam as a new gas field discovery in the Princeton area of Colusa County, R. S. Rheem, operator, was preparing to spud 1 Gomes as a ½-mile north outpost. The latter was getting under way in NW NE 25-18n-2w, in the same section as the shut-in discovery well.

The 1 Southam encountered a gas sand at 2,140-2,255 ft. in drilling to 5,064 ft., total depth. After plugging back to 2,335 ft., it was completed tthrough perforations at 2,215-30 ft. On initial production tests the well flowed at the daily rate of 1,500 M.c.f. through a ¼-in. choke and 2,850 M.c.f. through a ⅜-in. choke.

Tulare Gains Oil Producer

Tulare County, northern neighbor to Kern, the state's largest oil producing county, apparently has been given commercial oil production. A. J. McGreevy completed a wildcat in the Porterville area as a 60-bbl. producer through 176 ft. of perforations above 914 ft. Location of the new field discovery is in SE SE 22-22s-27e, an area in which several other wildcats encountered oil shows. The operator's second well is expected to be a north step-out.

Greenacres Discovery Is Completed

After recementing to cure a leaking bottom plug, C. W. Teater 1 Teater-Billington was completed as a new field discovery about 1½ miles south of Rosedale Ranch field, Kern County. Initial production was 173 bbl. daily, including a 32 per cent water cut. The 20-gravity crude was produced through perforations at approximately 4,289-4,344 ft.

Los Lobos Outpost Staked

Richfield Oil Corp. has staked location for a ½-mile southeast extension test to its recent deeper pool opener in Los Lobos field of extreme southern San Joaquin Valley. The test will be 58-20 Richfield-C. C. M. O. in SW SE 20-11n-22w. Its 27-20 San Emidio-A was completed in mid-December flowing 408 bbl. of 24°-gravity crude from the Reed Ridge sand (Miocene) at 6,490-6,657 ft. The operator's other eight wells produce from the Etchegoin sand of Pliocene age.

New Belgian Anticline Test

Honolulu Oil Corp. was preparing to start a 6,500-ft. wildcat in the Northwest Belgian Anticline area of westside San Joaquin Valley. Location is in 23-30s-21e, approximately 1¼ miles southeast of its 1 Honolulu-Watson-C. C. M. O., completed as a new pool discovery in the Phacoides sand last August. The new well, No. 4, will test Phacoides, Oceanic and Point of Rocks sand possibilities.

KANSAS

Oil Recovered on Test At Phillips Wildcat

Sohio Petroleum Co. recovered 850 ft. of free oil from the Lansing at a possible discovery well in Phillips County at the 1 Krause, SE SE SE 1-4s-19w, 2½ miles east of Peckham pool, and 4 miles southwest of Phillipsburg, Kansas.

Recovery on a drill-stem test at 3,247-77 ft. was 850 ft. of free oil with 1,140 psi. bottom-hole pressure. Sohio is waiting on cement with 5½-in. casing set at 3,421 ft.

Casing Set at Kingman Mississippi Strike

Pickrell Drilling Co. et al have 5-in. casing set and are waiting on cable tools at a possible pool discovery in southern Kingman County at 1 Banta, SW SW SW 34-30s-8w.

Recovery on a drill-stem test at 4,383-4,401 ft., open 1 hour, was 150 ft. of heavily oil-cut mud with 1,480 psi. bottom-hole pressure. Another test at 4,403-21 ft., open 1 hour, recovered 90 ft. of heavily oil and gas-cut mud, 120 ft. of muddy, gassy oil, 60 ft. of free oil and 5 ft. of water with 920 psi. pressure.

Seward Wildcat Reports Oil Shows Registered

Lansekan Oil Co. is drilling ahead below 5,880 ft. at a Seward County prospect in southwestern Kansas' Hugoton embayment area. The 1 Good, NW NW NW 20-34s-31w, 3 miles northeast of Liberal-Light pool, 4 miles west of Kneeland pool, recovered oil-cut mud and salt water with 1,050 psi. bottom-hole pressure on drill-stem test at 4,840-60 ft., open 1 hour. Flow pressure ranged frotm 40 to 150 psi. Another test taken at 4,860-75 ft., open 1 hour, recovered 110 ft. of oil-cut mud and 245 ft. of salt water.

Finney County Wildcat Pumps on First Tests

W. L. Hartman pumped 59 bbl. of oil in 18 hours during first tests at 1 Holstead-Thomason, SW SW SW 25-22s-33w, Finney County, 1½ miles east of Finnup pool. Marmaton oil production has been established from perforations at 4,442-50 ft.

Norton Wildcat to Complete After Swabbing Oil Shows

R. W. Shields is waiting on cement at 1 Mizell, SW SW NW 10-3s-25w, 8 miles northwest of Norton pool in Norton County, after swabbing oil shows and squeezing perforations in the Lansing. Recovery on a drill-stem test at 3,522-70 ft., open 45 minutes, was 15 ft. of free oil and 60 ft. of oil-cut mud with 225 psi. bottom-hole pressure.

Six Hits Finaled

Six new pool discovery wells were recently finaled in Kansas. In Barber County Barbara Oil Co. has a new pool at 1 Forester, SW NW NE 28-33s-11w. Pump potential is 163 bbl. of oil per day from the Mississippi. Anschutz Drilling Co. has a new Viola pool at 1 Holloway, NW NW SW 14-20s-4w,

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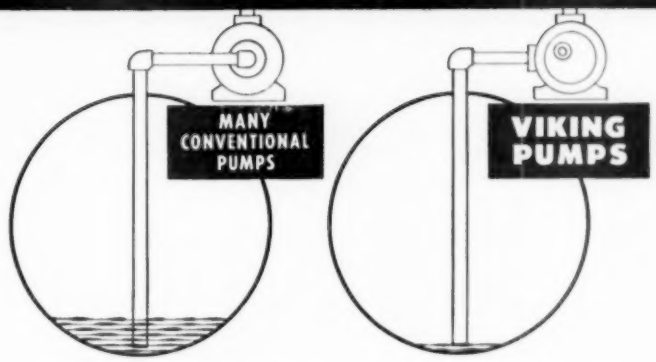

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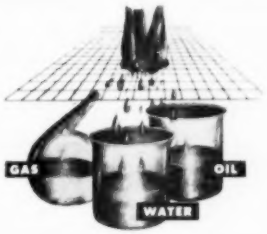

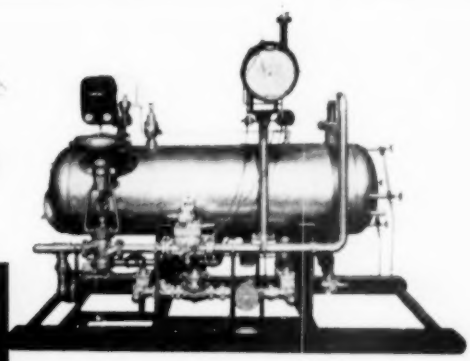

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McPherson County. Pump potential is 141 bbl. of oil per day.

Pawnee County has a new pool at GMR Oil Co. 1 Dufford "A." The Arbuckle gas discovery is good for 5,000 M.c.f. of gas per day. J. F. Darby has a 125-bbl. per day Arbuckle discovery in Rooks County at 1 Berland, NE NE SW 20-10s-19w. Potential is 27 bbl. of oil per day from the Arbuckle.

Important Gas Hit Made in Hugoton Area

An important gas discovery opening new reservoirs in Seward County, southwest Kansas, was announced by Cities Service Oil Co. in its 1 Holt "B" C NW NE, 28-32s-34w.

Located in the vast Hugoton gas field of the tri-state area of Kansas, Oklahoma and Texas, the discovery well flowed at the rate of 17.7 million cu. ft. of gas daily from the lower Topeka limestone formation at a depth of 4,200 ft. This is the first production established from this formation in the sprawling Hugoton field. The new producing horizon is deeper than the regular Hugoton gas pay which is normally encountered at 2,700 ft. Nearest production from this new zone is in the Cities Service discovered and developed Greenwood area 45 miles away. Three other prospective producing horizons deeper than the regular Hugoton pay will be tested before the new well is completed.

MISSOURI

Here is a current report on the new Trenton lime play 6 miles north of Lambert field in St. Louis County. New Florissant pool has 20 completed oil wells, all in Sections 6 and 7-47n-7e, near the town of Florissant, about 16 miles from St. Louis. The pool was opened in August at Laclede Gas Co. 1 Lang, a gas storage test, which cored oil saturation in the Trenton lime at 1,050 ft. The pay varies from 1,040-1,150 ft. depending on surface elevation. A minus of 500 ft. below sea level seems to define the producing limits of the new field, which is located on the extreme southwestern flank of the Illinois basin, and is the most important development in that basin in recent years. The good gravity oil brings $3.02 per well, less 45 cents trucking charge.

MICHIGAN

W. C. Taggart, Big Rapids, who made fortunes drilling Michigan Stray gas fields, most of which have since been converted for use as gas storage reservoirs, may have his first major oil strike in Michigan, in Bridgewater Township, Washtenaw County.

His 3 Curtis, S½ SW SW 28-4s-4e, was reported to have flowed in excess of 80 bbl. of oil natural in 2 hours from a pay tapped at about 1,030 ft. Although detailed information is not available, and tops of formations were not reported, well appears to be in the Traverse horizon. Well was cored to about 1,120 ft. before tests of this shallow pay were run. After well flowed the limited storage on the lease full, and had spilled some oil to pits, it was shut in awaiting installation of additional storage and other necessary production equipment.

A good evaluation of the importance of this strike could not be made at this time, but a 40-bbl. an hour natural-flowing oil well at 1,030 ft. is bound to be important. Its location on the southeastern rim of the Michigan basin, and in a virginal wildcat area, nearly 100 miles from other shallow Traverse oil pools, is bound to stimulate a drilling boom.

Evidence of Traverse oil in this area was first encountered at Taggart 1 Curtis, W½ SW SW 28-4s-4w, a Trenton objective wildcat which was below 3,000-ft. when reports of flow from the 3 Curtis were released. Oil at the 1 Curtis was encountered two or three weeks ago when drillers made a trip at about 1,100 ft. to change drilling bits. Information regarding these showings held "tight" for several weeks while lease work was completed by Taggart, but at the same time he announced that drilling permits for two shallow 1,150-ft. tests had been issued. One was for the 2 Curtis, W½ W½ SW 28-4s-4e, and the other was for the same location as the deep test (with footage differences), the 3 Curtis. The start of these two shallow tests appeared to be the "tip off" that something important might have been encountered at the first wildcat.

The first shallow test to follow the 1 Curtis was the same operator's 2 Curtis, which was reported to be under test this week with pipe set either above the pay horizon or through it. Very unofficial reports from the area on Christmas eve said that pay had been perforated, acidized and was under test. Testing, except for initial test, was delayed at this well until the 3 Curtis was drilled.

The Washtenaw County strike is probably the most rank wildcat to show important oil sources drilled in Michigan this year. Closest test drilled, according to early check of records, is located about 3 miles south and a mile west, a deep test failure. Other wildcat control points, all failures and drilled to formations below the Traverse, are located about 15 miles to the northwest; 11 miles to the north; and about 11 miles to the southeast. This Bridgewater area is located about 2 miles north of the town of Clinton and approximately 12 to 15 miles southeast of Ann Arbor. Taggart has a block of about 2,200

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acres in the area. Panhandle Eastern Pipeline Co. has a block nearby. The general area was said to have been surveyed by magnetometer.

OKLAHOMA

Success Seems Assured At Creek Confirmation

A new pool 2 miles east of Cushing field in Creek County has confirmation assured at Fordee Rhoades Oil Co. 1 Townsend, SE NW SE 36-17n-7e. A drill-stem test at 3,639-64 ft. recovered about 2,000 ft. of gas in the drill pipe with 60 ft. of oil-cut mud from the Wilcox. Elmer Laird 1 Townsend, NW SE SE 36-17n-7e, a renewed dry hole, opened the pool. It made 20 bbl. of oil on pump gage, but is not yet finaled.

Texas County Oil Pool Developing Rapidly

New Northwest Eva pool in Texas County, west of the Guymon-Hugoton gas field of the Oklahoma Panhandle, has two wells completed and six other prospects in various stages of progress.

United Carbon Co. is nearing completion at 3 Kelley, C NE NE 2-4n-10eCM. The well swabbed 70 bbl. of oil per day from perforations at 4,428-40 ft. The 4 Kelley, C SW NE Section 2, is testing. It flowed at the rate of 11 bbl. of oil per hour. The 5 Kelley, C NW NE 11, is showing for a gas well with a flow of 1,320 M.c.f. per day reported from perforations at 4,425-45 ft.

This new Morrow sand oil reservoir was one of the highlights of 1953 exploratory activity in the Panhandle portion of the Anadarko basin. It was opened last fall at 1 Kelley, C SE NE Section 2. The discovery well was good for 21 bbl. of oil and 71 M.c.f. of gas per day on a 1-in. tubing choke. The second well in the pool, United Producing Co. 2 Kelley, C NW NE, was completed for a pump gage of 130 bbl. of oil per day.

East Washington Pool Has Dual Completion

Woodward and Co. 1 Moorehead "A," NE NW NW 14-7n-3w, McClain County, is a dual completion for East Washington pool. The well flowed 672 bbl. of oil per day through ¾-in. choke and from Tulip Creek perforations at 9,550-70 ft. the well flowed 305 bbl. of oil in 24 hours through ½-in. choke. Gravity of both oil flows is 40°.

Just recently the 1 Smith, NE NE SE 10, flowed 432 bbl. of oil from the Bromide sand and 720 bbl. from the Tulip Creek. A south offset, the 2 Smith, NE SE SE 10, is drilling below 7,190 ft.

Panhandle Prospect Flows Morrow Oil

Oil exploration in the Oklahoma Panhandle portion of the Anadarko basin received a boost at The Texas Co. 1 Flowers-Johnson-Eldridge unit, 23-1n-19eCM, southern Texas County. Oil flow averaged 22 bbl. of 41°-gravity oil per hour on a test of Morrow sand perforations at 6,820-54 ft. The new well is 1 mile northeast of the 1 Cook, gas discovery in the area recently, and 1 mile southeast of the 1 Winfrey-Brown, which showed for 8,250 M.c.f. of gas per day from the Morrow sand at 7,075 ft.

The 1 Flowers-Johnson-Eldridge unit will test a gas show at the 6,100-ft. level above the Morrow section before completion.

Oklahoma County Test Is Possible Strike

Texas Crude Oil Co. 1 Lydia May, SE SE NW 10-13n-1e, 2 miles north of Jones pool in Oklahoma County, is a possible discovery well in the Oswego. A drill-stem test at 4,865-95 ft. flowed gas in 65 minutes and recovery was 110 ft. of oil-cut mud. Perforations were at 4,870-86 ft. in the Oswego. After acidization the well kicked off and flowed a large amount of gas and mud.

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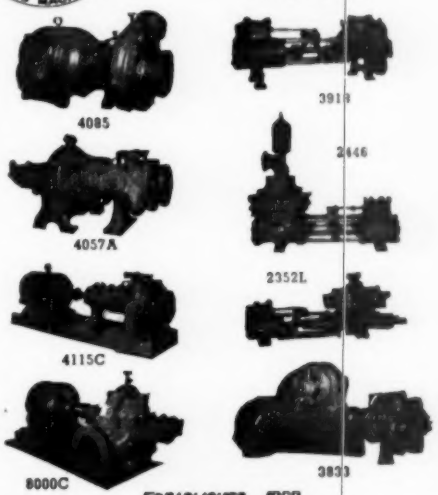

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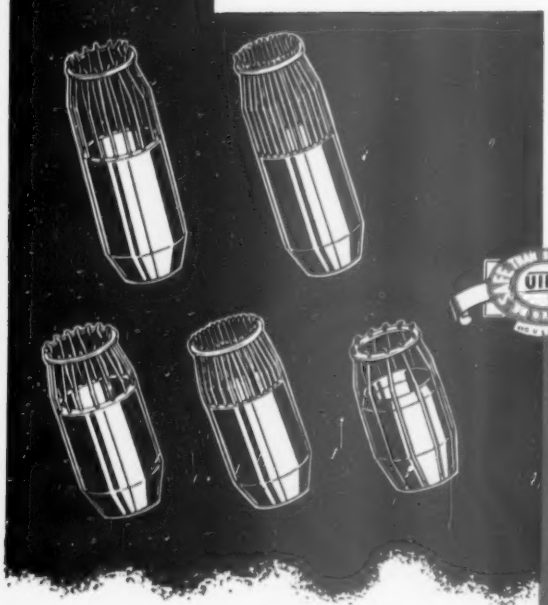

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NORTH DAKOTA

Stanolind Oil & Gas Co. has completed its first successful wildcat well in the Williston basin. The 1 Woodrow Star, McKenzie County, North Dakota, was completed after flowing 550 bbl. of 44°-gravity oil per day from the Devonian. Top of pay is 10,525 ft. Test was made through a 12/64-in. choke. Gas-oil ratio is 770. The well is plugged back to 10,571 ft. The wildcat is located in SW SE 21-152n-94w. It is on the Fort Berthold Indian Reservation. The well is the state's deepest producer.

Trotters Area Wildcat Gets Deeper Oil Show

Gulf Oil Corp. recovered shows in a series of Madison cores at 1 Government-Dorough, C NE SW 24-143n-193w, in the Trotters area, Golden Valley County. Cores 9,397-9,520 ft. were reported as principally hard and tight limestone with staining in fractures throughout. A 3-hour test 9,398-9,472 ft. recovered 1,120 ft. of salty sulfur water, with oil specks. Gulf is coring below 9,520 ft.

Dunn County Wildcat Has Oil Show

Carter Oil Co. recovered a foot of free oil in drill-stem test at 1 Lockwood, C SE NW 7-141n-94w in the Carsin area, Dunn County. Tool was open 5 hours in the zone 8,930-50 ft. Recovery also included 4 ft. of oil and cut mud and 719 ft. of salt water under flow pressure of 50-400 psi. The operator is coring below 8,950 ft. with the last top reported that of Charles at 8,248 ft.

Williams County Discovery Completed

Amerada Petroleum Corp. has completed 1 North Dakota F, C NW NW 36-155n-96w, Williams County, for a flow of 616 bbl. of oil per day through 15/64-in. choke. Production is 42° gravity and the producing zone is

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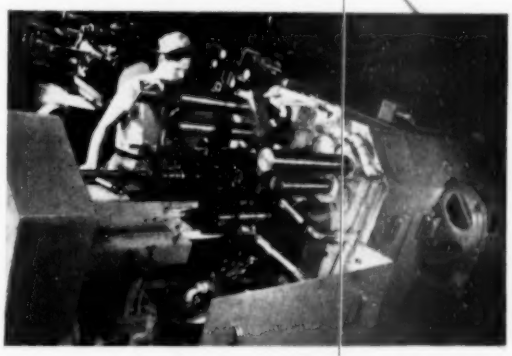

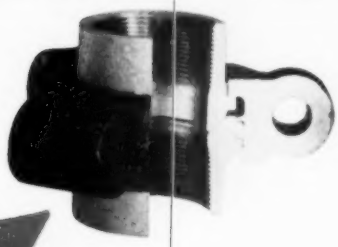

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Madison at 8,317-57 ft. The new pool opener is 3 miles south of Beaver Lodge field.

COLORADO

Three Southeastern Colorado Wildcats Staked

Following the success of tests of Lansing at the 1 Neu, SE SE NW 33-32s-41w, Baca County, Colorado, Amerada Petroleum Corp., and British-American Oil Producing Co. have made location for additional drilling. Amerada will drill 1 Newman, NE NE SW 36-33s-42w, northwest of the success. This operator will also drill 1-A Colorado State, NE NE SW 36-33s-42w, to the southwest. Both wells will go to Morrow sand. The successful well is considered an extension to Greenwood gas field in Morton County, Kansas. Carter Oil Co. has made location for an Arbuckle test at 1 State, 36-33s-44w. Carter holds a half interest in about 150,000 acres through the southeastern part of Colorado which was acquired by British-American.

Julesburg Deep Tests Fail

J. S. Abercrombie has announced abandonment of 1 State, NW NW SW 16-8s-67w in Douglas County. The well went to 10,807 ft., and reported no shows. It was an important test of the southern Denver-Julesburg basin. In Elbert County, Ginther-Warren-Ginther topped the "D" sand at 8,444 ft., at 1 Ward, C SE NE 29-10s-63w, and are drilling below 8,480 ft. No shows were reported. The wildcat will go to Morrison.

In the more northerly area of the basin, Ohio Oil Co. is plugging back for test of Greenhorn at 1 Nordloh, SE SE SE 20-5n-63w, Weld County. The well was deepened to Lyons, and total depth is now 8,327 ft.

WYOMING

Tensleep Production Found At Dickie Unit Offset

Stanolind Oil & Gas Co. has found an apparent new pay zone in Tensleep at the Dickie unit, Hot Springs County. The well, 2 Unit, NE NE NE 26-45n-101w, recovered 3,744 ft. of 22°-gravity oil from Tensleep at 6,764-6,804 ft., indicating a new pay for the recently productive unit. The discovery well in the 8,377-acre block was completed from a gage of 290 bbl. of oil per day from Phosphoria. Shows were found in this formation in the second well, but were not tested. Top of Tensleep was found at 6,768 ft.

Beaver Creek Madison Discovery Flows

Stanolind Oil & Gas Co. reported a flow of 41 bbl. of 40°-gravity oil in 64-minute drill-stem test of the Madison interval 11,389-11,447 ft. at 30-M, S½ NW NE 10-33n-96w. Flowing pressure was 855-4,000 psi. The well is the first to Madison in Beaver Creek field. Madison was topped at 11,189 ft., and previous drill-stem tests of three zones were successful. A test 11,379-89 ft. made 2,150 ft. of oil under flowing pressure of 1,815 psi.

Gas production at Beaver Creek is found in Muddy, Frontier and Cloverly over an extent of 4,700 acres. Tensleep production was found at Beaver Creek in 1949 with more than 1,300 acres proved. In 1951 Mesaverde oil production was established in the field. Stanolind is running casing at the new pay discovery, which, in view of the considerable acreage in the field, may be one of the more significant discoveries in the state during 1953.

Important Wildcats Scattered Over State

Several important Wyoming areas had new explorations announced at year's end. Delta Drilling Co. made location for a wildcat in the active northwestern area of Niobrara County. The operator will drill 1-A Delta-Williston-Government, C NE NE 6-39n-66w. Argo Oil Corp. is rigging up for 1 State, SE SE NW 36-41n-80w, Natrona County, the second test in the Lane Creek area. Superior Oil Co. will drill 27-30 Government, NE SW SW 30-26n-88w, in the West Mahoney area, Carbon County. The well is about 3 miles west of Mahoney dome where Tensleep production is found at about 4,300 ft. Pacific Western Oil Co. will drill 1 Tribal, SW SW SW 36-6n-3w(WRM) in the Northwest Sheldon Dome area, Fremont County.

MONTANA

Valley County Wildcat Finds Water in Madison

Murphy Corp. recovered fresh water on test of Madison at 1 Firemoon, C SE SE 12-30n-41e, in the East Porcupine Creek area, Valley County. Recovery on test 5,096-5,109 ft. was 370 ft. of fresh water and mud with a faint rainbow of oil, and 184 ft. of black sulfur water. The tool was opened 3 hours, and flowing pressure was 90-310 psi. A core of the zone showed 14 ft. of limestone with oil stain. The operator is drilling below 5,289 ft.

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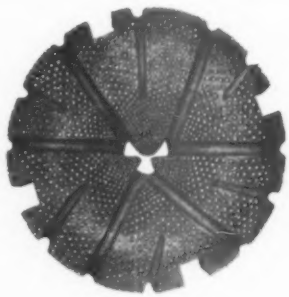

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Cabin Creek Confirmation In Ordovician

Shell Oil Co. is drilling below 9,349 ft. at 11-33 NPRR, SE NW NW 33-10n-58e, in the Cabon Creek area, Fallon County. The well is a confirmation attempt to the Silurian-Ordovician discovery in the area which was completed for a calculated gage of 4,235 bbl. per day. The present well tested the zone 8,965-9,024 ft. with recovery of 250 ft. of gassy, oily mud, 20 per cent oil. Test 9,030-9,118 ft. recovered only 190 ft. of mud with pinpoints of oil in 2½ hours.

NEBRASKA

Kimball County Discovery Indicated

Stanley T. Kiespert has recovered 15 ft. of apparently saturated D sand at 1 Long, NW NW SE 10-12n-55w, Kimball County. Core was of the zone 6,135-55 ft., and had fair porosity and even stain and fluorescence. The operator attempted test, which failed, and is now pulling core of the interval 6,150-58 ft. The area has produced oil from both D and J sands, but D sand production in the Kiespert wildcat will be a new discovery for the immediate area. Eddie Fisher, Denver independent, is preparing to complete an apparent J sand producer at 1 Harris, SW SE NW 11-12n-55w.

Pair of Cheyenne County Discoveries Completed

The Ohio Oil Co. has completed two recent Cheyenne County discoveries. At 1 Engelland, SE NW SE 33-15n-49w, the operator pumped 250 bbl. of oil per day.

At 1 Fleming, NE NE NW 28-13n-50w completion gage on pump was 84 bbl. of oil per day, cut 5 per cent water. This well is the first in the Southwest Sidney gas area to produce oil.

INDIANA

In Sullivan County, 10 miles west of the town of Sullivan, T&H Corp. is pump testing oil at the rate of 75 bbl. of oil per day from good Salem lime from perforations at 1,754-60 ft. The 1 Carl and Maurine Medsker, is located in NW NW SE 24-8n-11w. It is 2 miles from other production.

KENTUCKY

EASTERN KENTUCKY

In the Pike County sector of Big Sandy gas field, Kentucky-West Virginia Gas Co., have completed 6157 James Gibson in Poor Bottom Creek as a Maxon (Mississippian) sand gas producer. The well came in natural for an open flow potential of 15,068,000 cu. ft. of gas daily from 2,201 to 2,205 ft. Total depth of hole was 2,203 ft.

WESTERN KENTUCKY

Four miles north of Smith Mills in Henderson County good new Smith Mills North pool is enjoying rapid and successful development. It is being developed by Claude Trusler-Louie Galambos-Arde Oil Co. and Carter Oil Co. Cypress sand production is the main pay in the prolific field at about 2,350 ft. All wells are now on voluntary proration.

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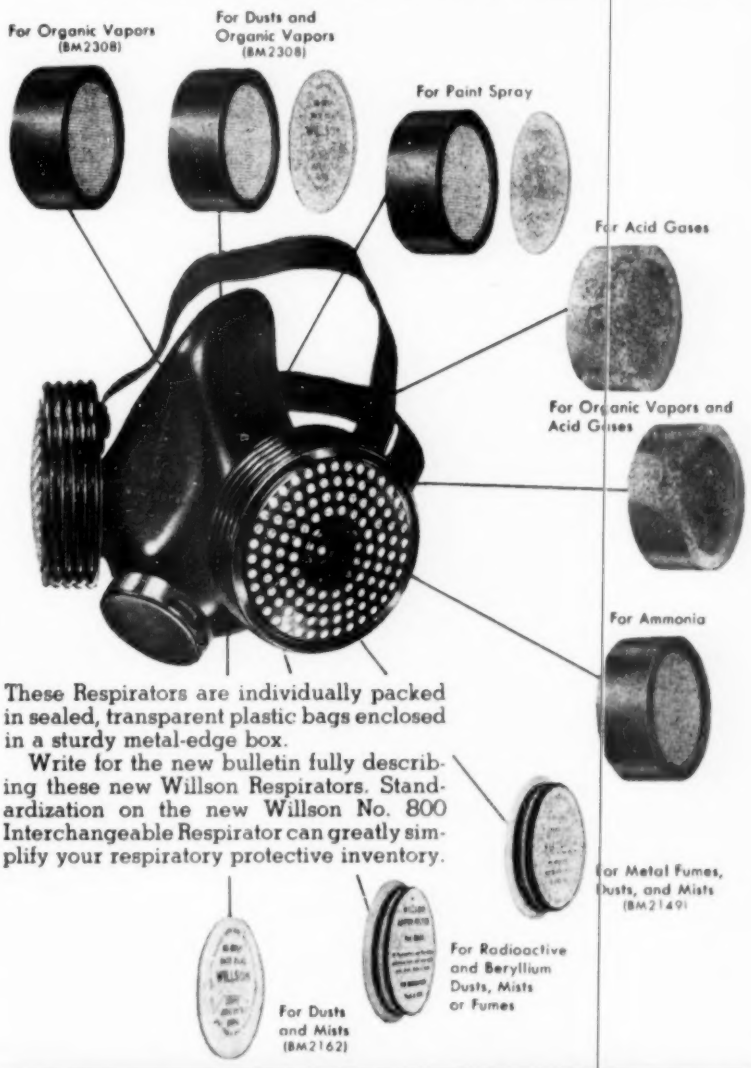
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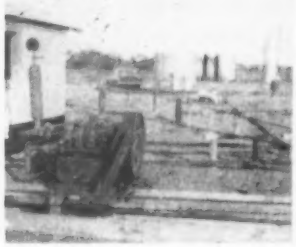
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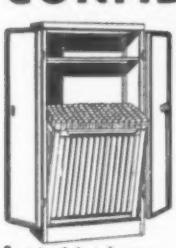
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TEXAS

TEXAS GULF COAST

Deep Producer Completed On Sour Lake East Flank

Deep sand development on the east flank of the old Sour Lake dome, in Hardin County, has resulted in another good producer. The new well, F. H. Carpenter and associates 2 Royalty Properties, in Lot 6 of the R. S. Sterling Subdivision, flowed 128 bbl. of clean oil through 7/64-in. choke in the first 17 hours. On a later gage, flow had increased to 178 bbl. per day with 2,600-psi. pressure. Production is from a casing-perforated interval at 7,174-84 ft.

New Gas-Distillate Pay Opened in South Rankin

Texas State Drilling Co. has opened a new gas-distillate producing reservoir in the South Rankin area, Harris County, with the completion of its Simmons, which flowed at a calculated rate of 17,000,000 cu. ft. of gas daily on open potential tests. Fluid recovery was at the rate of one barrel per 59,000 cu. ft. of gas. Fluid gravity was 58.8°. Flowing pressure was 2,706 psi. on tests through 12/64-in. choke. Producing interval is 7,998-8,002 ft. Location is west of a previously completed oil well, which since has been recompleted as a gas well in another shallower zone.

EAST TEXAS

Deep Well Scheduled For Anderson County

Tide Water Associated Oil Co. has made location for a 13,500-ft. Smackover test in Cayuga pool of northwest Anderson County. The well will be 6 H. R. Ramey, in the James Wilson Survey, A-793. Regular production in the field is from the Woodbine and Rodessa.

In Smith County, Humble Oil & Refining Co. 1 Gary became the second well in the Wright Mountain pool. Completion potential from Pettit limestone at 7,996-8,059 ft. was 247 bbl. of oil a day through ¾-in. choke.

A new gas pay in Rodessa limestone for the Kirvin-Pettit field of Freestone County was in prospect at V. L. Brown 1 Goolsby, ½-mile southeast outpost to the field. The new section was reported to have flowed gas and distillate from perforations between 6,491-98 ft. Dual completion is also planned from the Pettit at 7,096-7,100 ft.

WEST TEXAS

Midland Discovery Finaled, Andrews New Pay Logged

Two important discoveries were in the news as the year 1953 closed. In southwest Midland County, Reynolds Mining Corp. 1 Parks completed as a Strawn discovery, and southeast of Andrews, Continental Oil Co. added Ellenburger pay to its Wemac-Wolfcamp pool.

Completion potential on 1 Parks was 408 bbl. of oil a day through 16/64-in. choke. Final perforations were between 10,170-10,188 ft. Top of pay section was 10,163 ft. on elevation of 2,914 ft.

The well also flowed 149 bbl. of oil in 6

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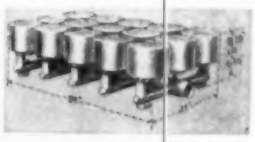
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hours through 16/64-in. choke from perforations at 10,395-10,410 ft. which has been tentatively identified as Bend limestone. The Bend group of limestone and shales is lower Pennsylvanian in age, and lies below the Strawn. Production from that group is more common to North Texas fields, where is in divided into the Smithwick and Marble Falls sections. Location is about 4 miles southwest of nearest Pennsylvanian production in the Parks area.

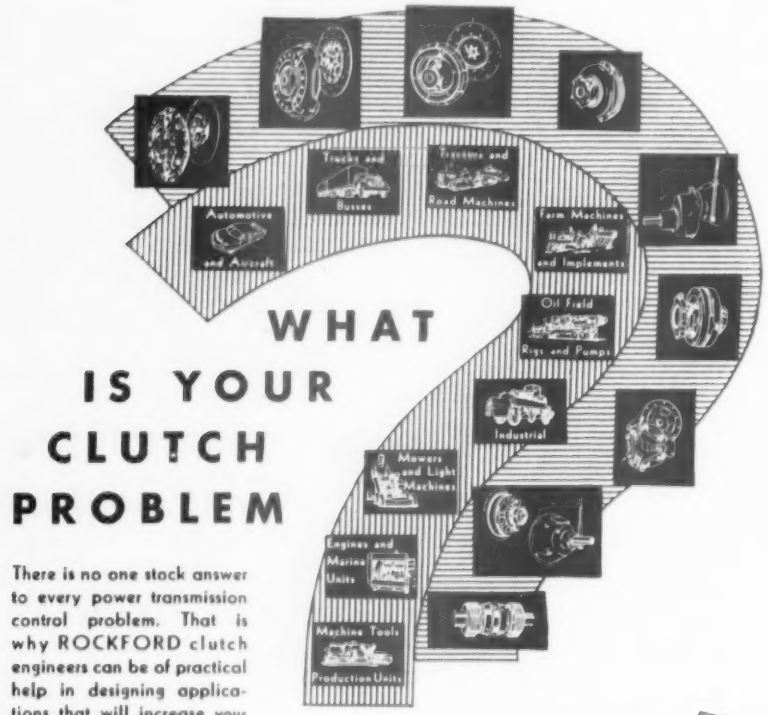
The county gained another Pennsylvanian discovery and completion at William Herbert Hunt 1 Windham, north of Pegasus field. Potential was 247 bbl. of oil a day through ⅛-in. choke from perforations between 10,416-10,472 ft. Top of pay was 10,412 ft. on elevation of 2,868 ft. Nearest production in Pegasus field is a Devonian and Ellenburger well.

Ellenburger discovery . . . Continental 5 McCollum & Weibusch, south offset to the Wemac pool discovery and first deep test in the area, made two heavy flows of oil from the Ellenburger.

First test at 13,259-13,329 ft. flowed 63 bbl. of oil in 1 hour. A second test, between 13,329-13,342 ft., had fluid at the top in 45 minutes, was cleaned into pits for 20 minutes, then tanked 80 bbl. of clean oil in 1 hour. Gas-oil ratio was 553 cu. ft. Operators were pulling the testing tool at this report.

Shows of oil in a new area of northern Andrews County were reported at Stanolind Oil & Gas Co. 1-BN University. Location in Section 8 of Block 5 is 3 miles southwest of L. M. Glasco and others' recent Devonian discovery. Tentative top of the Ellenburger was 13,930 ft. Drill-stem test between 13,953-13,978 ft., open 3 hours, recovered oil and gas-cut water blanket, 20 ft. of free oil and 2,160 ft. of heavily oil and gas-cut mud. Operators were to core ahead and test.

Yoakum County . . . J. C. Barnes et al 1 Turrentine, east of the shallow Ownby pool, completed as a Wolfcamp discovery. The project was originally drilled dry to 7,920 ft. Completion potential was 295 bbl. of oil a day through ¾-in. choke from perforations at 9,894-9,924 ft. after acid treatment.



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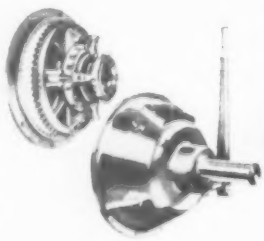

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NORTH TEXAS

Nolan Wildcat Flows Reef Oil

Sun Oil Co. 3 Ruth Harp, central Nolan County wildcat, flowed 52 bbl. of clean oil in 14 hours from an open-hole section in a Pennsylvanian reef at 5,900-14 ft. The test was through ⅝-in. choke. Operators moved the rig and prepared to complete.

Location in 13-X-T&P RR Survey is about 2 miles southeast of Trammel field. Top of the reef was logged at 5,908 ft., minus 3,386 ft.

In Callahan County, 10 miles west of Cross Plains, Pethybridge & Erlich 1 Scott opened flush production from a shallow zone. First test at 1,805-12 ft. had flowing oil in 22 minutes, estimated at 15 bbl. hourly. Operators ran casing, then tested in open hole between 1,800-12 ft., total depth. Initial flow was at the rate of 40 bbl. hourly through 24/64-in. choke.

J. K. Hughes Oil Co. 1 Burton, discovery 8 miles southwest of Anson in Jones County, completed for 144 bbl. of oil a day. Production was through ½-in. choke from perforations in a sand at 3,385-93 ft.

In southeast Taylor County, French M. Robertson 1 Dorothea Griffin had prospects of a Gray sand discovery. A 2-hour drill stem test from 3,877-94 ft. had gas in 2 minutes and oil in 87 minutes. The well then flowed at an estimated rate of 15-20 bbl. hourly. Operators ran casing for completion tests.

East-central Baylor County had a new deep test scheduled as J. B. Randle 1-A Green. Projected depth was 5,400 ft. and location is 10 miles southeast of Seymour in Section 15, H&TC Survey. Nearby production is from the 3,000-ft. level.

Cox Drilling Co. 1 Ancell, 8 miles west of Kamay in Wilbarger County, completed as a discovery in pay between 3,986-98 ft. On completion test through ¼-in. choke the well flowed 260 bbl. of oil a day. The same company's 2 Ancell, southeast offset to the discovery, drilled lime with oil shows from 4,160-4,233 ft.

SOUTHWEST TEXAS

Gas Producer Opens New Jim Wells County Field

A new gas-producing reservoir has been opened 1 mile west of Little Rose field, 3 miles south of Alfred, in Jim Wells County, where L. O. Kelsey has completed his 1 Ragland making 7,600,000 cu. ft. of gas per day on open flow test from a sand interval at 5,000-12 ft. Shut-in pressure is 1,807 psi. The discovery has been designated as Ragland field.

Hole had been drilled to 5,706 ft. early this year by George W. Graham. The present operator recently plugged back to 5,208 ft., ran casing to 5,060 ft., and perforated the pipe at the above producing interval for completion.

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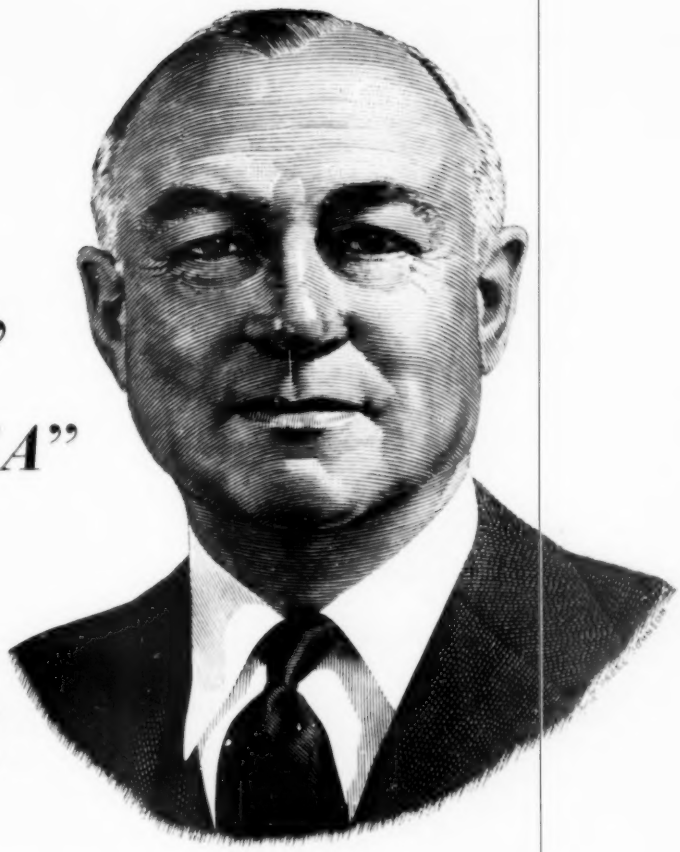

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MISSISSIPPI

Franklin County Discovery Indicates New Wilcox Pool

Indications of another Wilcox field, the eleventh discovered in southwestern Mississippi this year, have been given in drill-stem tests in southwestern Franklin County wildcat drilled by J. Paul Ratliff and Petersen Drilling Co.

The wildcat, 1 Butler, located in 40-5n-1e, about 2 miles northwest of the recently discovered North Freewoods field, recovered 1,710 ft. of clean oil in a 15-minute test through ¼-in. choke of a sand interval at 6,533-41 ft.

Other oil-saturated sand intervals had been indicated by logs at 6,005-07 ft., 6,386-89 ft., and 6,501-11 ft. Casing now is being run for completion with bottom of the hole at 7,010 ft.

Second Producer Confirms New Deep Oil Pay at Soso

Discovery several months ago of Lower Cretaceous production at Soso, on the Jones-Jasper county line, has been confirmed with completion by Gulf Refining Co. of its second well in that horizon.

The new producer, 1 Edwards-Taylor unit, northeast diagonal offset to Gulf's deep discovery well, 1 Bailey, flowed 11.29 bbl. of 41.5°-gravity oil per hour during a 12-hour test through ⅛-in. choke, gaging 1,575-psi. pressure with gas-oil ratio of 388 cu. ft. per barrel.

Production is from casing perforations at 12,039-45 ft. in the lower part of the Glen Rose zone, in which the discovery well is perforated at 11,987-90 ft. The well had approximately 85 ft. of oil-saturated sand in two zones, at 11,478-536 ft. and 11,983-12,054 ft. An additional 30 ft. of gas sand at 9,733-68 ft., also in lower Cretaceous, also was cored and drill-stem tested.

Prior to the lower Cretaceous discovery, a sizable gas-distillate producing area had been established in upper Cretaceous-Eutaw sands.

Another lower Cretaceous test, located about a mile southeast of the Gulf wells, is now being drilled by Humble Oil & Refining Co. At latest report, it was making hole below 9,900 ft.

LOUISIANA

SOUTH LOUISIANA

Acadia Parish Discovery Produces Gas-Distillate

Tide Water Associated Oil Co. is opening a new gas-distillate producing area 2 miles northeast of Sunray Oil Corp.'s multi-pay Northwest Branch field, in Acadia Parish, where its 1 Comeaux, in 83-8s-2e, is reported to have flowed at the rate 4,460,000 cu. ft. of gas daily with 47.8°-gravity distillate at the rate of 58 bbl. per million cubic feet. Flowing pressure gaged 5,825 psi. Production is from the Frio-Tweedel zone, perforated at 11,800-06 ft.

Southern Minerals Corp. 1 Frey, new oil discovery well in 24-7s-1w, northern Acadia Parish, has been put on the pump and is reported making 60 bbl. of fluid daily, of which a substantial percentage is 23°-gravity oil. Testing continues with casing perforated at 4,203½-08½ ft.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Frio County: Howeth & Mason 1 Speer et ux, R. M. Harkness Sur. 6, A-886. Dry. TD 6,612 ft.

Gonzales County: Ada Oil Co. 1 Batey, John Neil Sur., A-366. Dry. TD 6,503 ft.

Guadalupe County: Pat H. Baker 1 Fee, J. W. Robinson Sur. Dry. TD 2,824 ft.

McMullen County: J. R. Butler 3 Hays-Exell, P. Fadden Sur., A-4. Dry. TD 1,605 ft.

Wilson County: J. C. McCabe et al 1 Watson, Mario Cavillo Sur., A-5. Dry. TD 5,429 ft.

TEXAS GULF COAST

Brazoria County: Brazos Oil & Gas Co. and Ohio Oil Co. 1 State "XC" 33719, State Tract 32. IP 78,000 M.c.f. daily, open flow, casing perforations 6,100-10 ft. TD 6,624 ft. (New field.)

Jack W. Frazier 1 Rossi et al, Lot 23, H. N. Little Sur., A-919 (northwest flank Manvel dome). Dry. TD 5,626 ft.

DeWitt County: Francis J. Haynes 1 Swimler, James S. Turner Sur., A-460. Dry. TD 8,355 ft.

Harris County: K & H Operating Co. 1 Kraft et al, Van Wormer Sur., A-1656. Dry. TD 6,500 ft.

Newman Brothers Drilling Co. and Geotek Oil Co. 1 Neuhaus et al, GC&SF Sur., A-1499. IP 4,180 M.c.f. daily, open flow, casing perforations 5,712-20 ft. TD 7,210 ft. (New field.)

Jackson County: Belaire Oil Co. and Intex Oil Co. 1 A & I, Victor Blanco Sur., A-3. Dry. TD 4,092 ft.

Jefferson County: H. F. Dishman 1 Byrne, T&NO Sur. 269, A-377. Dry. TD 11,016 ft.

Liberty County: John W. Mecom et al 1 Boyd et al, J. H. Chism Sur., A-163. Shut down. TD 15,294 ft.

Scurlock Oil Co. 1 Daniel estate, Blk. 16, Baker M. Spinks Sur., A-108. Dry. TD 7,312 ft.

Matagorda County: J. S. Michael 1 Buckner Orphans Home et al, James Moore Sur., A-62. Dry. TD 9,512 ft.

Montgomery County: Union Oil Co. of California 1 Grogan-Cochran, Caddo Allen Sur., A-45. Dry. TD 7,203 ft.

Refugio County: Carrl Oil Co. and Petrocel Corp. 1 Glover, J. Sinnot Sur., A-68. Dry. TD 6,210 ft.

T-C Oil Co. 1-C O'Connor, John Keating Lge., A-40. Dry. TD 7,100 ft.

EAST TEXAS

Anderson County: Otis Dunagan and Mike Matise 1 Delaney, Philip Martin Sur. IPP 2 BOPD, pay 474 ft. TD 522 ft.

Dunagan and Matise 1 Thompson, Robert Erwin Sur. IPP 2 BOPD, pay 470 ft. TD 525 ft.

Henderson County: Sanders & Murchison 1 Thomas & Pate, David Cherry Sur., A-135. Dry. TD 4,508 ft. Elev. 515 ft., Woodbine 4,340 ft.

Kaufman County: Thos. D. Humphrey & Sons 1 Williamson, Timothy DeVore Sur., A-115. IP 114 BOPD, 10/64-in., 37°, Lewisville perforations 3,382-84 ft. TD 3,991 ft.

L. O. McMillan 1 Smith, E. Ables Sur., A-6. Dry. TD 4,967 ft.

Marion County: F. R. Jackson 1 Rowell estate, Ed Meyer Sur., A-498. Dry. TD 6,500 ft.

Navarro County: Lyle Cashion Co. 1 Gordon, C. R. Sanders Sur., A-744. Dry. TD 3,467 ft. Elev. 431 ft., Woodbine 3,178 ft.

Hunter Co., Inc. 1 Ragsdale, Appleton Gray Sur., A-309. Dry. TD 1,571 ft.

Stroube-Central Oil Co. 1 Pattison estate, Enoch Frier Sur., A-3. Dry. TD 2,808 ft.

Robertson County: K. L. McHenry 1 Abraham, Dennis Haggerty Sur., A-172. Dry. TD 4,875 ft.

Sabine County: Benedum-Trees Oil Co. 1 Smith, Juan Ignato Pifermo Sur., A-47. Dry. TD 7,960 ft.

Upshur County: Crescent Drilling Co. and Robert Cargill 1 Mrs. R. J. Mackey, Drury Reed Sur., A-420. IP 133 BOPD, ½-in., Pettit 7,757-63 ft., IP 181 BOPD, ¼-in., Travis Peak 7,795-7,805 ft. TD 7,906 ft. Dual completion.

Wood County: A. V. Erwin & Associates 1 Woodard, J. B. Chirino Sur., A-96. Dry. TD 5,083 ft.

Wise Drilling Account 1 Gibson, A. Barcenas Sur., A-79. Dry. TD 5,311 ft.

WEST CENTRAL TEXAS

Callahan County: Burt Oil Co. 2 Hodges, G. W. Denton Sur. 362. Dry. TD 2,055 ft.

Henry Cohen 1 Tom Windham, Sec. 164, GH&H Sur. Dry. TD 1,201 ft.

Fletcher Oil & Gas Corp. 1 Osborne, Sec. 43, BBB&C Sur. Dry. TD 4,373 ft.

G. C. Tisdale 1 Whitehead, Sec. 7, BBB&C Sur. Dry. TD 1,502 ft.

B. C. Wadefield 1 Estes, Sec. 59, BBB&C Sur. Dry. TD 2,251 ft.

Coleman County: AB-Tex Drilling Co. 1 Turner, Sec. 280, Wm. Skirlock Sur. Dry. TD 2,130 ft.

Falcon Oil Corp. 1 Shelton, Subd. 16, L. C. Manson Sur. 80. Dry. TD 2,455 ft.

Chas. O. Henderson 1 Veterans Land Board, 95-4-Richard Perry Sur. Dry. TD 1,259 ft.

Sam J. Kline 1 DeBusk, D. J. Holt Sur. 166. Dry. TD 2,392 ft.

C. C. Thomas 1 Jess Howard, HT&B Sur. 59. Dry. TD 1,816 ft.

Eastland County: Clark P. Chandler 2-B Coates, 9-3-H&TC. IP 309 BOPD, 20/64-in., 43°, conglomerate perforations 3,321-30 ft. TD 3,375 ft.

Haynes B. Ownby Drilling Co. 1-A Mrs. Leila Clark, 97-3-H&TC. Dry. TD 2,858 ft.

F. J. Saddler 1 George Fox, Jr., Sec. 58, McClennan CSL. Dry. TD 3,739 ft.

Fisher County: Seaboard Oil Co. 1 Weems, 170-2-H&TC. Dry. TD 6,805 ft. Elev. 1,967 ft., Caddo 6,408 ft., Ellenburger 6,630 ft.

Robert M. Bass 1 Terrell, 86-1-H&TC. Dry. TD 3,460 ft.

E. C. Johnston 2 John Sumral, 90-1-H&TC. Dry. TD 5,037 ft.

Sid Katz Exploration Co. 1 Maberry, 56-1-HT&B. Dry. TD 6,204 ft. Elev. 1,970 ft. Strawn sand 5,520 ft., Ellenburger 6,098 ft.

Jones County: C. U. Bay 1-A Dunagan, 16-17-T&P. IP 177 BOPD, 16/64-in., 45°, Gunsight lime 2,731-36 ft. TD 2,960 ft. East offset to Swastika discovery.

Pan American Production Co. 1 Agee, Sec. 44, D&DA. Dry. TD 3,027 ft.

Paul C. Teas 1 R. L. Watts, Sec. 34, D&DA. Dry. TD 2,317 ft.

Shackelford County: Deer Drilling Co. 1-B Nail, Sec. 153, ETRR Sur. Dry. TD 1,578 ft.

Taylor County: R. G. Piper 1 Fulwiler, J. C. Eccles Sur. 472. Dry. TD 4,525 ft.

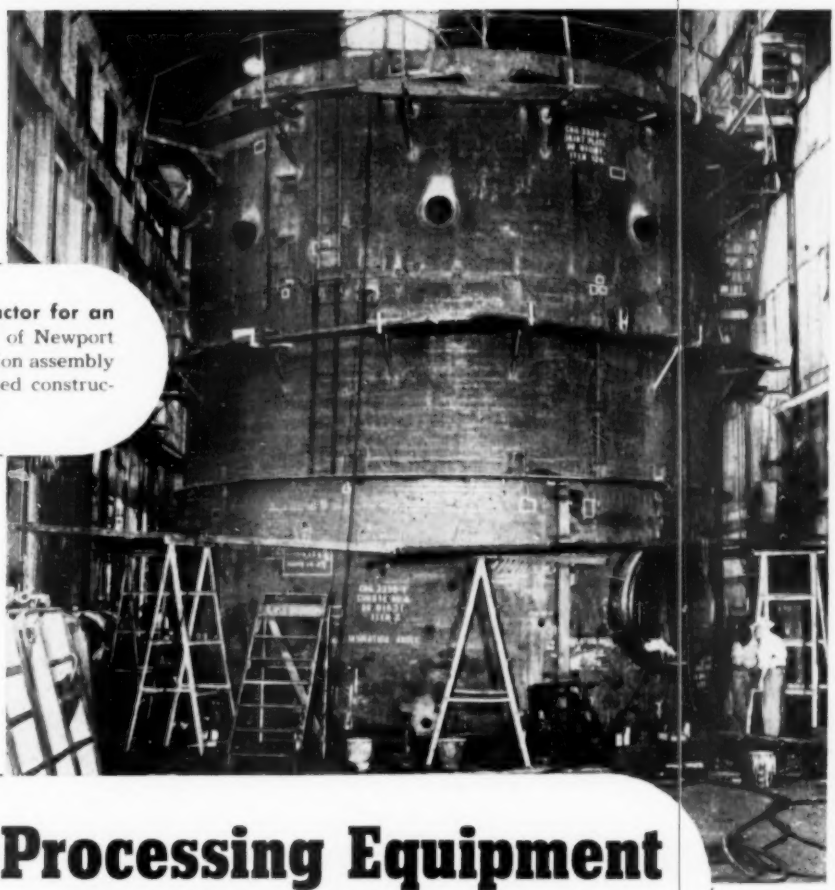
Throckmorton County: Jim-Lee Drilling Co. 1 Smith, Sec. 3082, TE&L Sur. Dry. TD 5,430 ft.

Russell Maguire 1 Swenson, Sec. 178, BBB&C. Dry. TD 5,524 ft.

Taubert & Harper 1 Copeland, Sec. 2109, TE&L Sur., A-520. IP 208 BOPD, 16/64-in., Strawn pay 3,330 ft. TD 3,336 ft.

NORTH TEXAS

Archer County: C. U. Bay 1 Goodwin, Blk. 133, J. W. Harris Subd. Dry. TD 3,800 ft.



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WILDCAT COMPLETIONS

L. T. Burns 1 Meurer, Lot 18, Blk. 3, Clark & Plumb. Dry. TD 4,699 ft.

Cox Drilling Co. 1 Schrieber, Lot 67, Blk. 4, Clark & Plumb. Dry. TD 5,335 ft.

James W. Harvey 1 Abercrombie, Blk. 70, J. Harris Subd. Dry. TD 1,410 ft.

Tom B. Medders 1 Gose, 2-8-GH&H. IPP 29 BOPD, 41°, sand pay 3,690 ft. TD 3,705 ft.

Scott Brothers 1 Poirot, Lot 53, Blk. 3, Clark & Plumb. Dry. TD 4,131 ft.

Harry F. Snebold 1-A Petrex Oil Corp., 1-114-ATNCL. Dry. TD 1,497 ft.

Clay County: L. T. Burns 1 Gill, TE&L Sur. 2869, A-555. Dry. TD 6,908 ft.

Cooke County: Sun Oil Co. 1 Blagg, Wm. M. Huey Sur., A-452. Dry. TD 2,628 ft.

Denton County: Urban J. Endres 1 Sullivan, S. Yoachum Jr. Sur., A-1440. IPP 60.8 BOPD, 42°, pay 1,688-92 ft. TD 1,882 ft.

Jack County: Lone Star Producing Co. 1-B Cherryhomes, J. S. Rozell Sur., A-1490. IP 5,400 M.f.g., plus 8 bbl. distillate per 1,000 M.f.g., top pay 5,369 ft. TD 5,738 ft.

Star Oil Co. 1 Johnson heirs, R. Parker Sur., A-461. Dry. TD 4,004 ft.

Star Oil 3 Worthington, SA&MG Sur., A-589. Dry. TD 3,508 ft.

Warren Petroleum Corp. 1 Hensley, G. Gates Sur., A-237. Dry. TD 5,300 ft.

Knox County: Miami Operating Co. 1 Beavers, 235-44-H&TC. Dry. TD 6,509 ft.

Montague County: Arnold H. Bruner 1 Mary K. Shields, Abel A. Lewis Sur., A-420. IPP 51 BOPD, Strawn sand 4,891-4,901 ft. TD 5,900 ft.

Central Exploration Oil Co. & Associates 1 Lee Crenshaw, J. T. A. McHugh Sur., A-548. Dry. TD 5,925 ft.

Miami Operating Co. 2 Van Vacter, TE&L Sur. 2814, A-756. Dry. TD 6,924 ft.

Wichita County: I. Dee Campbell 1 Allingham, 32-5-H&TC. Dry. TD 1,840 ft.

Louis Sikes 2 Louis Sikes Fee, J. A. Scott Sur. 7, A-295. IPP 43 BOPD, pay 4,920 ft., TD 4,941 ft.

Young County: Darden & Terry 1 Heard, Blk. 78, TE&L Sur. Drry. TD 1,087 ft.

Denver Company 1 W. E. Steele, Indianola RR Sur., A-156. IP 42 BOPD, ½-in., pay 2,982 ft. TD 2,991 ft.

Jim-Lee Drilling Co. 1 Washburn, TE&L Sur. 1114. Dry. TD 4,570 ft.

Republic Natural Gas Co. 1 Bailey, Blk. 26, TE&L Sur., A-302. IP BOPD, 7/64-in., Mississippian pay 4,846 ft. TD 4,927 ft.

WEST TEXAS

Andrews County: Kerr-McGee Oil Industries 1 Means, 18-3-PSL. Dry. TD 10,967 ft. Elev. 3,107 ft., Strawn 10,610 ft.

Sharples Oil Corp. 1-A Means, 16-3-PSL. Dry. TD 12,783 ft. Elev. 3,102 ft., Devonian 12,650 ft.

I. M. Glasco et al 1 L. L. Butler, 14-A19-PSL Sur., new discovery 17 miles NE Andrews. IP 1,973 BOPD, ½-in., 39°, GOR 126 cu. ft., Devonian pay 12,543 ft. TD 12,563 ft.

Coke County: Condor Petroleum Co. 1 Norton Properties, Sec. 4, L. N. Taylor Sur. Dry. TD 5,615 ft.

Crockett County: Continental Oil Co. 1 University, 36-31-University Lands Sur. Dry. TD 8,958 ft. Elev. 2,508 ft., Simpson 8,092 ft., Ellenburger 8,363 ft.

Humble Oil & Refining Co. 1-U University, 17-46-University Lands. Dry. TD 10,271 ft. Elev. 2,585 ft. estimated, Simpson 9,300 ft., Ellenburger 9,288 ft.

Oliver & Kotyza 1 Cox, Blk. 4, E. Ruiz Sur. IPP 27 BOPD, 25°, pay 855 ft. TD 884 ft.

Howard County: Woodson Oil Co. 1 Cole, 36-26-H&TC. Dry. TD 8,399 ft. Elev. 2,333 ft., Mississippian 8,287 ft., reef 7,877 ft.

Irion County: M. A. Machris 1 Catherine Funk Wall, 34-10-SPRR. Dry. TD 1,025 ft.

Kent County: Blanco Oil Co. and Newman Bros. 1 S. M. Swenson, 3-2-H&GN. IP 320 BOPD, ¼-in., 37°, Pennsylvanian reef 6,638 ft. TD 6,655 ft.

Kimble County: J. Y. Francis 1 Louie Ragland, Wm. Berry Sur. 370. Dry. TD 2,117 ft.

Pecos County: San Juan Exploration Co. 1 Fonnie Woodward, 40-11-H&GN. IPP 33 BOPD, 32°, pay 2,840 ft. TD 2,933 ft.

Runnels County: R. D. Sterling 2 Birdie B. Williams, E. Mathers Sur. 535. Dry. TD 4,491 ft.

Schleicher County: D. T. Dougherty 1 Luke Robinson, 59-1-GH&SA. Dry. TD 6,120 ft. Elev. 2,339 ft., Strawn 6,035 ft.

Forest Oil Corp. and Southern Minerals Corp. 1 Willoughby, 11-2-GC&SF. Dry. TD 710 ft.

Sutton County: Hunt Oil Co. 1 Carnie Wyatt, 9-6-TS&NG. Dry. TD 4,653 ft. Elev. 2,249 ft., reef 3,828 ft., Ellenburger 4,155 ft.

The Texas Co. 1-A McIntosh, 80-K-GH&SA. Dry. TD 6,800 ft. Elev. 2,321 ft., Strawn reef 6,550 ft., Ellenburger 6,465 ft.

The Texas Co. 1-B McIntosh, 78-K-GH&SO. Dry. TD 6,800 ft. Elev. 2,315 ft., Ellenburger 6,510 ft.

Upton County: Gulf Oil Corp. 3 McElroy Ranch Co.-State, 182-E-CCSD&RGNG. Ellenburger IP 709 BOPD, 53°, top pay 11,575 ft. Silurian IP 919 BOPD, 53°, top pay 10,533 ft. Elev. 2,607 ft., TD 12,017 ft.

Texas Pacific Coal & Oil Co. 1A M. Eglof, 3-X-J. H. Gibson Sur. Dry. TD 11,933 ft. Elev. 2,828 ft., Ellenburger 11,675 ft.

Winkler County: C. E. Marsh 1 Amburgey, 10-B9-PSL. Dry. TD 9,475 ft.

Yoakum County: Lawton Oil Co. et al 1 McGinty, 454-D-J. H. Gibson Sur. Dry. TD 11,570 ft. Pennsylvanian lime 9,890 ft., Pennsylvanian sand 11,036 ft.

SOUTHEAST NEW MEXICO

Lea County: Emperior Oil Co. 1-B Amerada-State, 13-21s-33e. Dry. TD 3,536 ft.

ILLINOIS

Clinton County: J. F. Dunnill 1 Murphy, SE NW NW 9-2n-3w. Dry. TD 1,080 ft.

Coles County: J. G. Ellis 1 Johnston, NW SE NE 9-13n-14w. Dry. TD 250 ft.

Edwards County: Kewanee Oil Co. 1 Bass, NW SW NE 17-2s-14w. Dry. TD 3,124 ft.

Effingham County: Ashland Oil & Refining Co. 1 Sundermeyer, SW NE NE 36-6n-6e. Dry. TD 2,897 ft.

Montgomery County: Calvert Drilling Co. 1 Brohammer-Greenwood, SW NE NE 20-7n-2w. Dry. TD 3,302 ft.

Washington County: Theo. G. Glass 1 Heidsiek, NW SW SE 6-1s-1w. Dry. TD 1,533 ft.

Wayne County: Shulman Bros. 1 Caudle, SW SW NW 11-1n-5e. Dry. TD 3,114 ft.

INDIANA

Daviess County: Marion Chapman 1 Carrico, SE NE SW 30-3n-5w. Dry. TD 788 ft.

Posey County: Slagter Production Co. 1 Reichert, SE NW SE 27-8s-14w. Dry. TD 2,994 ft.

Spencer County: Rea Drilling Co. 1 St. Meinrad Abbey, SW NE SW 24-4s-4w. Dry. TD 693 ft.

Sullivan County: J. A. MacDonell 1 C.&E.I.RR, SE NE NE 6-8n-8w. Dry. TD 1,316 ft.

Vigo County: Sun Oil Co. 1 Howard Unit, NE SW NE 27-13n-9w. Dry. TD 906 ft.

F. B. Cline 1 Sessinger, NW NW NE 15-11n-8w. Dry. TD 1,838 ft.

KENTUCKY

Daviess County: W. R. Bedingfield 1 Higdon, NW NW SE 18-P-32. Dry. TD 1,291 ft.

WEST VIRGINIA

Monongalia County: Morgan district: Hope Natural Gas Co., 9745 Rosa B. Wolfe, elevation 1,648 ft. Dry. Tully 6,837 ft., Onondago 7,257 ft., chert 7,277 ft., show gas 7,358 ft., Oriskany sand 7,478-7,554 ft., Tonoloway 7,959 ft., Salt 8,380-8,410 ft., 8,427-8,480 ft., and 8,502 ft., TD 8,508 ft.

ALABAMA

Escambia County: Sunnyland Contracting Co. 1 Brannon, C SE NW 29-1n-9e. Dry. TD 6,317 ft. Elev. 72 ft., Lower Cretaceous 6,285 ft.

MISSISSIPPI

Clay County: Union Producing Co. 1 Henderson, NE SW SE 22-15s-4e. Dry. TD 10,551 ft. Elev. 437 ft., Pennsylvanian 1,750 ft., Mississippian 8,820 ft., Carter zone 10,278 ft., Sanders zone 10,455 ft.

Jefferson County: D. A. Biglane and Vasser & Brown 1 Shields-Netter, 22-8n-2w. Dry. TD 6,303 ft. Elev. 196 ft., Wilcox 3,850 ft., Artman zone 5,543 ft.

Wayne County: Texas Pacific Coal & Oil Co. 1 U. L. Busby Account 2, 34-9n-7w. Dry. TD 5,560 ft. Elev. 195 ft., Wilcox 1,270 ft., Tuscaloosa 5,480 ft.

SOUTH LOUISIANA

Jefferson Parish: California Co. 1 LeRay, 88-14s-23e. Dry. TD 9,988 ft.

Jefferson Davis Parish: California Co. 1 Richard, 23-7s-3w. Dry. TD 8,670 ft.

Lafourche Parish: Interstate Natural Gas Co., Inc. 2 Grandison, 11-19s-23e. IP 215 BOPD, 8/64-in., 38.3°, casing perforations 10,084-86 ft. TD 12,004 ft. (New pay in Coffee Bay field.)

Plaquemines Parish: John W. Mecom and Freeport Sulphur Co. 4 State Lease 2028, 34-19s-26e. IP 205 BOPD, 12/64-in., 29.9°, casing perforations 13,210-32 ft. TD 15,115 ft. (New pay in Lake Washington field.)

Phillis Petroleum Co. 6 Fasterling, 44-20s-28e. IP 308 BOPD, 14/64-in., 37°, casing perforations 11,162-72 ft. TD 14,262 ft. (New pay in Bastian Bay field.)

St. Landry Parish: Sohio Petroleum Co. 1 Boagni, 71-4s-4e. Dry. TD 11,631 ft.

St. Martin Parish: Pan Am Southern Corp. 1 Gauthier, 113-10s-6e (St. Martinville area). Dry. TD 11,697 ft.

Terrebonne Parish: Superior Oil Co. 1 L. L. & E. Unit 16, 28-21s-13e. Junked hole. TD 12,977 ft.

OKLAHOMA

Carter County: Signal Oil & Gas Co. 1 Newcomb, NE SE NW 1-5s-1w. Dry. TD 8,453 ft.

Creek County: Ben J. Taylor 1 Ary, SW SE NW 30-16n-7e. Dry. TD 3,773 ft.

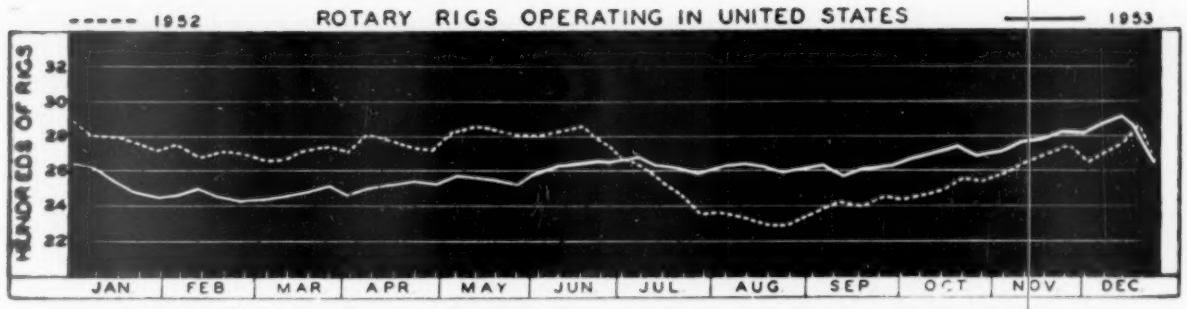
Garvin County: Falcon Seaboard Drilling Co. 1 Cunningham, C SW NE 17-3n-4w. Dry. TD 11,907 ft.

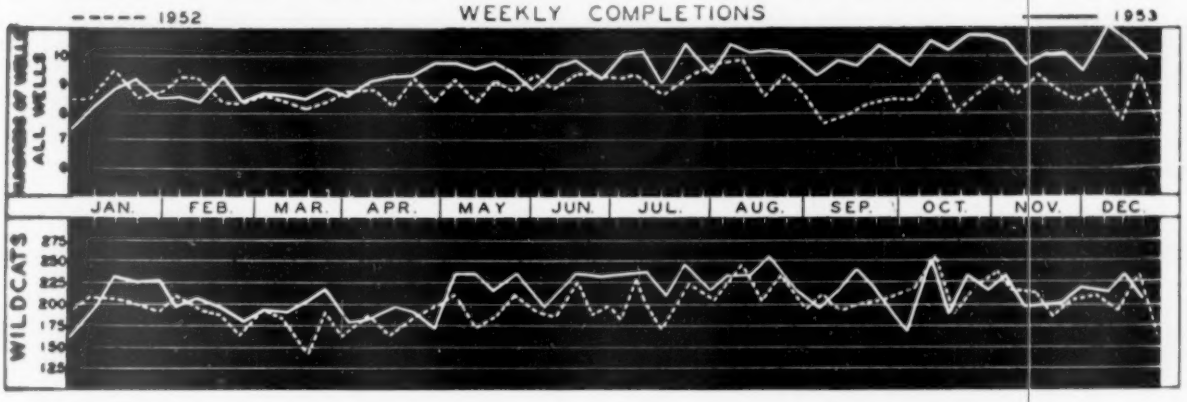
Northern Oil Corp. and Guy L. Warren 1 White, NW NW NE 17-4n-2w. Dry. TD 7,337 ft.

Cities Service Oil Co. 1 Showalter, C NW SE 35-4n-4w. IPF 171 BOPD, Hart sand 8,502-67 ft., 212 BOPD, Springer 9,384-9,446 ft., 19/64-in., ¼-in., 42° and 39° gravity. TD 9,590 ft. (Oil discovery.)

Grady County: Mercury Drilling Co. and Mid-States et al 1 Whitener, C NW NE 25-5n-7w. IPF 240 BOPD, Deese 9,369-

(Continued on page 152)





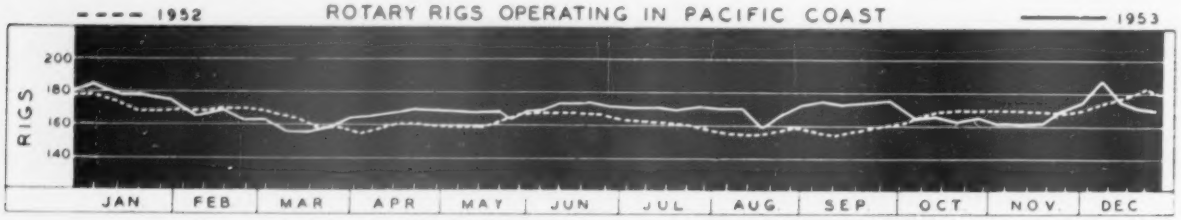
CURRENT STATISTICS

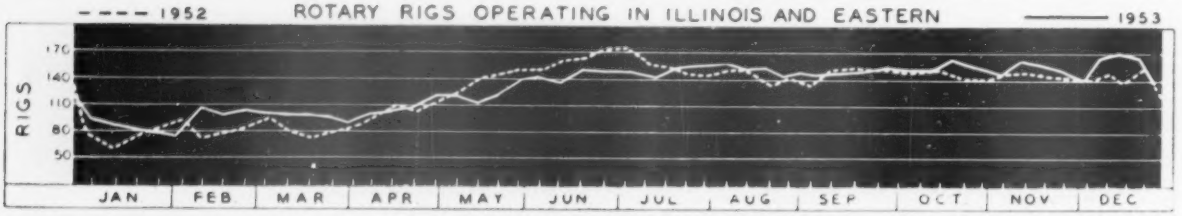
EXPLORATION

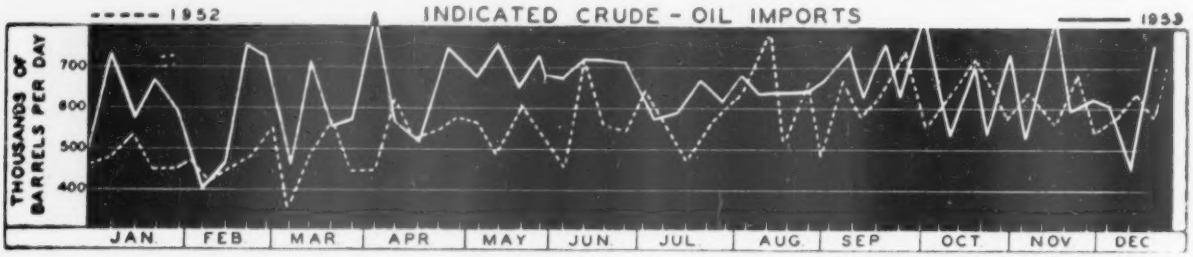
WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 26, 1953

	Total of all wells					Dec. 26		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	14	7	0	7	22,550	749	764	0	0	0	0	0	0	0	0	0	0
Pennsylvania	39	19	5	15	86,378	1,902	1,907	0	0	0	0	0	0	0	3	14	17
West Virginia	13	1	11	1	35,625	622	590	0	0	0	1	1	0	0	12	10	22
Ohio	11	5	1	5	27,940	1,046	1,063	0	0	0	0	0	2	0	5	14	21
Indiana	14	4	0	10	20,940	1,304	1,274	0	0	0	6	6	13	0	5	358	374
Kentucky	19	7	6	6	39,392	1,175	1,288	0	0	0	1	1	14	0	1	195	210
Illinois	54	32	0	22	142,917	2,191	2,130	0	0	0	7	7	5	0	0	416	421
Michigan	12	6	0	6	29,067	614	696	0	0	0	3	3	18	0	5	251	274
Kansas	84	35	8	41	291,903	4,679	4,486	3	0	2	15	20	93	0	37	742	872
Nebraska	7	3	1	3	37,906	315	282	2	0	0	0	2	20	0	5	130	155
Oklahoma	172	116	10	46	644,605	7,442	5,690	2	0	1	8	11	114	6	37	584	741
Texas	309	170	13	126	1,400,690	16,942	16,845	18	0	3	82	103	842	6	162	4,154	5,221
North Central (Dist. 7-B & 9)	142	71	1	70	478,786	6,416	5,540	9	0	1	39	49	439	0	18	1,651	2,109
West (Dist. 7-C & 8)	89	69	0	20	500,773	3,700	4,945	5	0	0	17	22	177		13	679	871
Panhandle (Dist. 10)	0	0	0	0	0	766	633	0	0	0	0	0	0		0	21	23
Eastern (Dist. 5 & 6)	25	7	7	11	125,524	804	785	4	0	0	10	14	27		5	265	299
Gulf Coast (Dist. 2 & 3)	41	17	5	19	253,213	2,499	2,582	0	0	2	11	13	98	2	69	680	875
Southwest (Dist. 1 & 4)	12	6	0	6	42,394	2,757	2,360	0	0	0	5	5	101	2	57	858	1,045
Louisiana	58	37	6	15	361,767	2,789	2,350	3	0	0	5	8	88	3	21	365	510
Northern	31	20	5	6	87,945	1,251	1,269	0	0	0	0	0	12		2	155	171
Southern	27	17	1	9	273,822	1,538	1,081	3	0	0	5	8	76	3	19	210	339
Arkansas	12	9	0	3	35,107	562	417	0	0	0	0	0	12	1	0	128	140
Mississippi	6	2	0	4	40,772	394	348	0	0	0	3	3	20	1	3	174	200
Southeastern States	3	0	0	3	13,360	144	82	0	0	0	1	1	1	0	0	116	117
Montana	9	4	0	5	32,918	447	336	0	0	0	1	1	12	3	0	113	125
Wyoming	54	35	2	17	212,992	901	682	1	0	0	10	11	28	0	3	156	187
Colorado	21	4	2	15	104,101	723	471	0	0	0	9	9	29	0	12	315	356
Utah	0	0	0	0	0	70	79	0	0	0	0	0	3	0	4	35	42
New Mexico	17	10	6	1	81,221	1,381	1,035	0	0	0	1	1	26	1	18	124	169
California	60	41	1	18	232,954	2,544	2,390	2	0	1	13	16	71	1	14	564	650
North Dakota	0	0	0	0	0	257	119	0	0	0	0	0	9	1	1	75	85
Miscellaneous	0	0	0	0	0	73	131	0	0	0	0	0	1	0	4	45	50
Total United States	988	547	72	369	3,895,105	49,266	45,450	31	0	7	166	204	1,421	108	352	9,078	10,959
Total previous week	1,049	591	63	395	4,201,914			25	3	5	201	234	1,390	108	345	8,912	10,755
Total December 27, 1952	756	387	50	319	2,953,913			16	2	3	134	155	1,348	79	253	8,638	10,318

Service wells included: 87, 112, 32, 81.





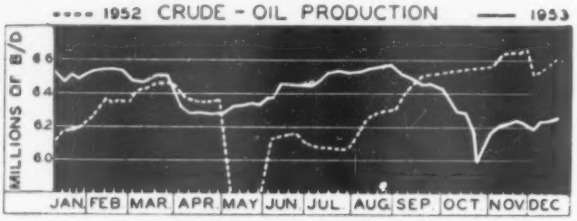


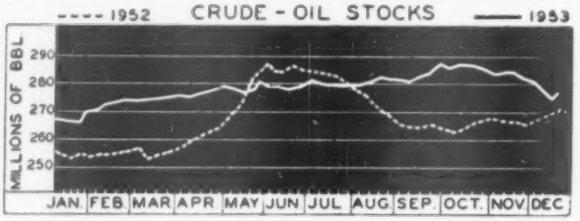
DAILY AVERAGE PRODUCTION FOR WEEK

	December 26 Crude oil	December 26 Lease condensate	December 26 Total	Dec. 19 total
Alabama	4,400		4,400	4,300
Arkansas	76,550	600	77,150	76,500
California	1,010,800		1,010,800	1,010,100
Colorado	109,800		109,800	106,700
Eastern	59,500		59,500	59,500
Florida	1,475		1,475	1,475
Illinois	169,800		169,800	168,400
Indiana	32,400		32,400	34,000
Kansas	323,700		323,700	321,500
Kentucky	32,100		32,100	32,700
Louisiana	626,150	40,600	666,750	666,200
North	104,650	3,600	108,250	107,700
South	521,500	37,000	558,500	558,500
Michigan	32,400		32,400	33,100
Mississippi	93,000	3,500	96,500	95,950
Montana	34,300		34,300	34,900
Nebraska	14,400		14,400	14,000
New Mexico	192,700	900	193,600	193,500
Oklahoma	532,400		532,400	533,700
Texas	2,558,050	48,175	2,606,225	2,606,225
Dist. 1	38,575	425	39,000	39,000
Dist. 2	133,975	6,225	141,200	141,200
Dist. 3	412,250	23,650	435,900	435,900
Dist. 4	239,500	6,050	245,550	245,550
Dist. 5	44,350	450	44,800	44,800
Dist. 6	114,100	5,200	119,300	119,300
East Texas field	231,100		231,100	231,100
Dist. 7-B	120,500	50	120,550	120,550
Dist. 7-C	154,925	4,425	159,350	159,350
Dist. 8	807,700	1,400	809,100	809,100
Dist. 9	182,575	250	182,825	182,825
Dist. 10	77,500	50	77,550	77,550
Utah	5,000		5,000	4,400
Wyoming	243,200		243,200	242,300
North Dakota	14,500		14,500	14,300
Total U. S.	6,166,625	93,775	6,260,400	6,253,750
Change from previous week			up 6,650	
Canada	288,650		288,650	230,000

Total U. S. production January 1-December 26 2,322,216,700 bbl.
Same period last year (crude plus cond.) 2,259,010,970 bbl.

*Includes 30,287,285 bbl. condensate.



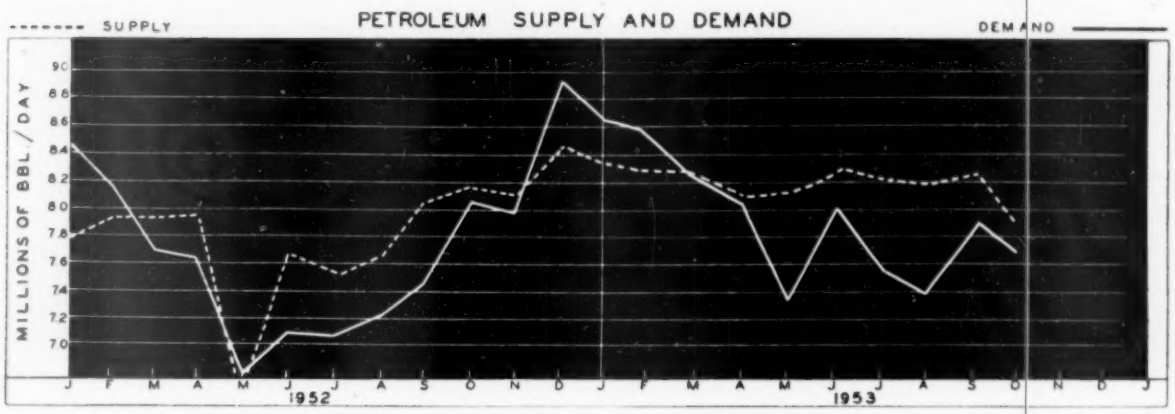


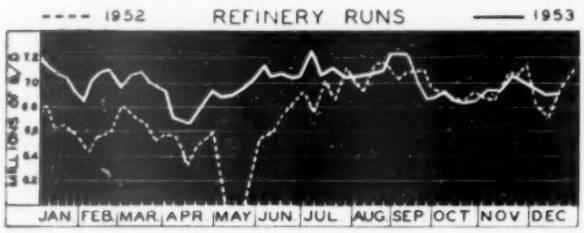
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

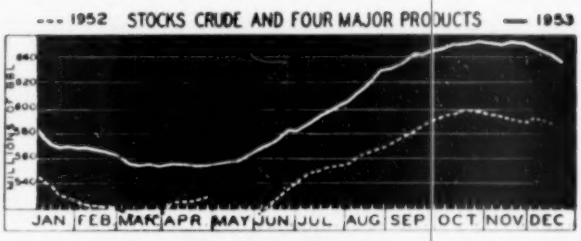
(Thousand of barrels)

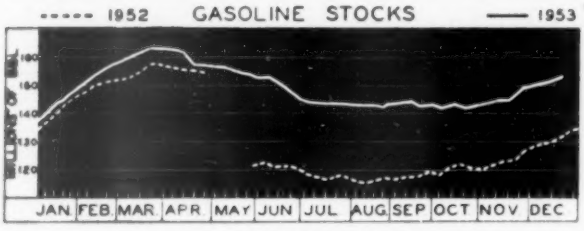
	Dec. 19, '53	Dec. 12, '53	Dec. 20, '52
Pennsylvania Grade	2,562	2,617	2,273
Other Appalachian	1,634	1,680	1,691
Illinois, Indiana, Michigan	12,390	12,243	11,065
Arkansas	3,301	3,431	3,305
Louisiana	17,848	17,252	16,267
North	3,025	3,110	2,350
Gulf	14,823	14,142	13,917
Mississippi	3,452	3,437	3,072
New Mexico	8,881	8,947	7,426
Oklahoma and Kansas	35,595	35,564	37,452
Texas	129,051	130,189	135,004
East Texas	11,451	11,491	12,158
West Texas	56,284	55,404	61,596
Texas Gulf	26,054	27,369	26,589
Other Texas	35,262	35,925	34,661
Rocky Mountain	16,962	16,925	14,773
California	33,717	34,662	31,504
Foreign	†11,773	10,463	7,952
Total	277,166	277,410	271,784

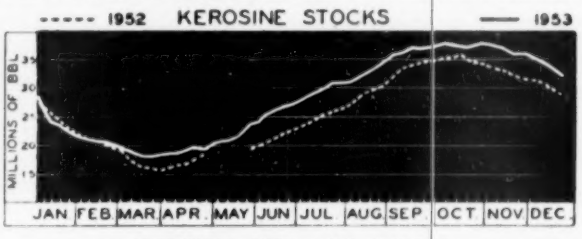
*Bureau of Mines. †Includes 3,054,000 bbl. in California.

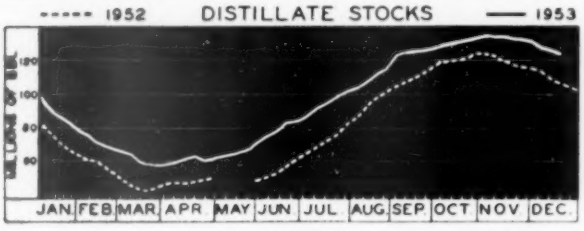


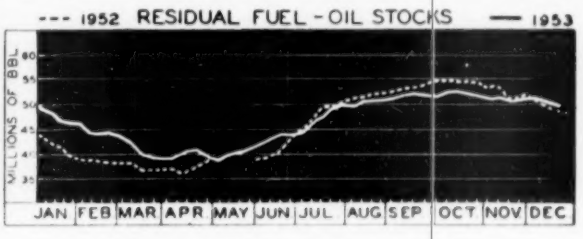












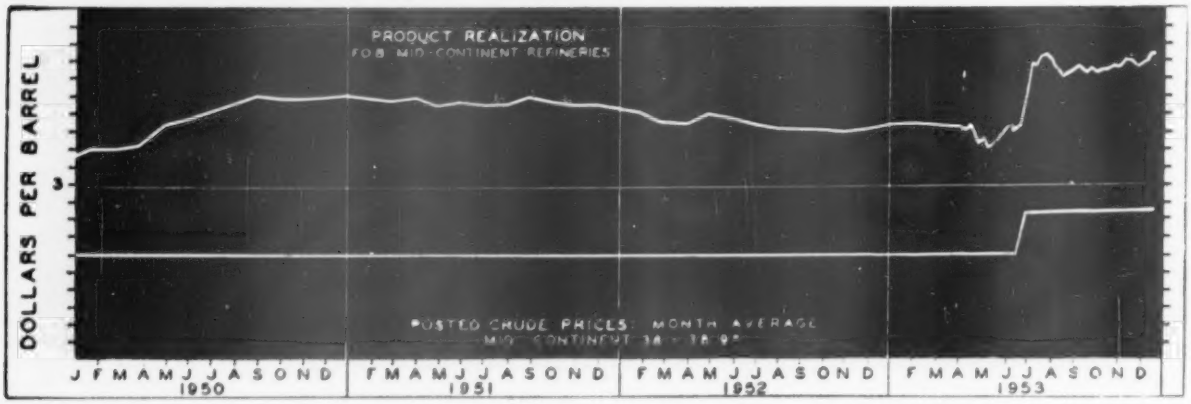
(A.P.I. reports for both December 26 and January 2 will be in the next issue)

A.P.I. REFINERY REPORT, DECEMBER 19

(Thousand of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks†—Gaso.‡	Kero.	Dist.	Resid.	Bureau of Mines, December 1952—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	999	439.9	39.0	231.7	213.6	33,234	13,937	46,822	11,476	1,058	441.8	45.2	283.8	247.8
Appalachian:														
District 1	120	45.9	7.6	22.6	11.3	4,215	662	1,566	893	108	48.3	5.9	18.8	14.5
District 2	72	42.1	4.7	14.0	11.7	2,040	582	713	199	94	47.9	7.6	15.0	15.1
Ind., Ill., Ky.	1,337	702.0	84.4	229.6	184.1	31,031	8,291	21,820	4,494	1,289	673.7	100.5	230.7	189.8
Okla., Kans., Mo.	554	333.2	13.4	132.9	40.9	15,994	1,701	11,690	1,255	566	333.2	14.3	139.3	63.9
Inland Texas	230	178.1	8.3	35.4	23.6	5,816	402	2,381	1,289	255	170.0	12.4	40.2	36.9
Texas Gulf Coast	1,668	799.7	125.9	420.6	234.1	22,672	3,666	14,893	6,628	1,717	802.0	139.2	427.3	262.5
La. Gulf Coast	544	289.7	64.6	126.0	44.3	9,193	2,105	6,603	1,623	553	267.9	71.0	123.8	56.4
N. La. and Ark.	62	30.1	5.4	17.4	6.0	3,599	410	976	164	85	34.9	9.8	19.5	7.1
Rocky Mountain:														
New Mexico	19	12.3		2.7	2.6	213		53	28	19	12.4	0.8	2.4	4.1
Other Rocky Mtn.	255	127.3	4.7	56.7	41.1	5,366	257	2,453	922	235	119.1	8.1	46.4	46.8
California	1,058	440.3	2.1	170.4	369.7	20,213	376	13,474	21,004	973	409.3	6.5	161.4	356.7
Dec. 19, 1953	6,918	3,440.6	360.1	1,460.0	1,183.0	153,586	32,389	123,444	49,975	6,952	3,360.5	421.3	1,508.6	1,301.6
Dec. 12, 1953	6,915	3,500.3	386.9	1,482.4	1,157.1	152,509	33,865	126,710	50,455					
Dec. 20, 1952	6,928	3,356.7	420.3	1,511.9	1,304.9	131,017	28,652	105,884	48,504					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.74 for week ended December 19, $3.75 for previous week, and $3.36 for December 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of December 29, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.875-11.5	12.5-13.5	10.625-11.75
Premium gasoline	11.875-12.5	13.75-14.5	11.75-12.75
42-44 w.w. kerosine	8.875-9.25	10.25-10.4	8.875-9.5
No. 2 straw fuel oil	7.875-8.25	9.25-9.4	8-8.5
No. 6 residual	$1.45-1.55	$2.25-2.40	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.10	6.35

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	12.5-13.75
750 vis., No. 3-4 neutral	15.5-16.75
2,000 No. 5-6 neutral	17-18.75

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	19.5
200 vis., No. 3 neutral, 0-10 pp.	14.25

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	20.5
180 vis., 10 p.t. neutral	24.5

WAX
Mid-Continent

132-134 A.M.P.	6.0

THE winter weather that came to some of the important distillate-consuming areas during the last half of December resulted in movement out of primary storage about in line with increases in consumption. However, some marketers feel that there may still be some secondary inventory depletion in the coming weeks to balance some of the excess moved to secondary tanks during parts of November.

Most of the decreases in primary distillate inventories in the past few weeks have been in the marketing areas. In the 3-week period from November 28 to December 19, distillate stocks on the East Coast dropped 3,115,000 bbl. compared with a decrease of only 1,729,000 bbl. in the Gulf Coast districts of Texas and Louisiana. In the Illinois-Indiana-Michigan areas of District 2, distillate stocks were off 2,531,000 bbl. compared with a reduction of only 863,000 bbl. in the Oklahoma-Kansas-Missouri supply area.

A picture of the loss in demand in the early part of December is shown by a comparison of distillate production and stock changes. For the 3-week period ended December 19, refinery production of distillate fuels was 873,000 bbl. less than for the same period last year. Despite this reduction in refinery output of distillate, the decrease in primary distillate inventories was 2,800,000 bbl. less than last year.

Since pipe-line and water terminals have been loaded with light heating oils, some secondary suppliers have been shifting the inventory load to primary suppliers by not refilling secondary storage. The jobber sees little chance of a general shortage, at least in January. By the middle of February, most of the heating-oil distributors will be working toward cutting distillate stocks enough to have near-empty tanks by the end of the season.

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex ‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Prices East of California effective June 15, 1953. California prices effective February 16, 1953. Pennsylvania Grade prices effective September 21, 1953.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.05
Southwest Pennsylvania	3.61
West Virginia	3.55
Ohio	3.54
Illinois Basin	3.02

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TRAFFIC MAN to handle all phases of tank car movements for petroleum products in newly organized company-owned traffic department. Salary commensurate with qualifications. All replies will be considered confidential. Mail letter of application to Box G-838, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER BS, age to 35. 3 to 5 years experience in hydrocarbon process plant design, Gulf Coast location. Reply should include full resume of education, experience, references and salary expected Box G-836, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES MANAGER for oil well equipment business, having engineering education, 10 to 15 years' experience in sales and supervisory capacities and having major oil company contacts. Age 35-45. Substantial salary and commission. Submit detailed resume of qualifications to Box G-843, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC SUPERVISOR required by expanding and aggressive seismic contracting company. Should have ability to supervise any domestic area and have good professional contacts. Minimum requirements: college degree in geophysics or related fields and eight years' seismic experience. Good future. Tulsa location. Box G-705, The Oil and Gas Journal, Tulsa, Oklahoma.

INSTRUMENT MECHANIC

Major Oil Company in Venezuela has opening for Instrument Mechanic with minimum of 2 years' experience in repairing and maintaining controls, recorders, and safety shut-down instruments normally used in compressor plants and natural gas absorption plants.

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RESERVOIR ENGINEER

For New York office of major foreign producer. Proficient in mathematics with 4 or more years' extensive experience in oil and gas reservoir engineering on primary and secondary recovery problems. Duties will include preparations of basic field production and reservoir data for application in analogue and digital computors, performance of analytical analysis of field behavior and interpretation and preparation of resulting data for reservoir engineering reports on specific fields.

Write giving full particulars regarding personal history and work experience. Please include telephone number.

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BOX OG-6
Arabian-American
Oil Company

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New York 22, N. Y.

CHIEF CHEMIST experienced in Pod column work and gasoline plant process and product control testing to take charge of laboratory located at large gasoline plant in West Texas. Housing furnished and salary to be commensurate with qualifications of applicant. Please furnish experience record and salary expected. Our employees have been notified of this advertisement. Box G-776, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

GEOLOGIST WANTED with 1 to 3 years' experience with major company. Location in Amarillo with expanding and aggressive company. Require degree in Geology or Geological Engineering, should have experience in well site work and be familiar with regional and subsurface studies, though not necessarily in Panhandle area. Furnish references, age, technical background and salary expected. Replies will be kept strictly confidential, excellent salary and ample opportunity for advancement. Contact Mr. H. S. Carver, Box 951, Amarillo, Texas.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

SITUATIONS WANTED

EXPERIENCED LAND MAN: Age 50, 24 years experience, mostly with major companies in Texas, New Mexico, Louisiana, Mississippi, Georgia, Florida, Alabama. Degree Civil Engineering plus 1 year Geology, plus 1 year Law. Qualified for any position in Land Department. Free to move to any area. Box G-835, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, desires position as Seismic Supervisor. Thirteen years experience. Education in electronics and geology. Particularly interested in record reinterpretation. Box G-833, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

C.P.A. DESIRES position as controller, treasurer, office manager, with oil company or related organization. 21 years extensive, diversified experience with oil industry, including producing, refining, and marketing. Public accounting and tax background. Presently employed in managerial capacity. Middle 40's, married, will relocate. Resume on request. Box G-831, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 30, married, 4 years varied experience—reservoir, production, completions, remedial work. Desires responsible position with aggressive independent or individual. Box G-839, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLOITATION ENGINEER with major, desires work involving reservoir and production engineering. B. S. in P. E. 5½ years' field and reservoir experience. Box G-842, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE ACCOUNTANT, management experience with completely integrated independent petroleum companies, desires to relocate. Box G-845, The Oil and Gas Journal, Tulsa, Oklahoma.

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ACCOUNTANT, oil production and heavy industrial experience. Box G-824, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST—31, married, 2 years seismograph, 7 years' major company field-office experience Mid-Continent area, desires to relocate with independent company. Box G-841, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 31, married, one child, Bachelor degrees in petroleum engineering and geology. Five and one-half years' major company experience in drilling, production, subsurface geology and reservoir engineering. Desires job with independent or consultant involving subsurface geology, reservoir engineering or both. Box G-840, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE—CERTIFIED PUBLIC ACCOUNTANT—COLLEGE DEGREE offers 17 years' experience in developing and managing oil and gas properties, operating hydrocarbon recovery plants. Familiar with taxes, financing, marketing, lease arrangements, joint ventures. Seeking responsible position in Houston. George D. Blocher, 3638 Wichersham Lane, Houston 19, Texas.

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The Oil and Gas Journal
Tulsa, Oklahoma

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EQUIPMENT MEN

A.C.F. Names Hamill to Valve Sales Staff

W. L. HAMILL

Walter L. Hamill has been appointed by American Car & Foundry Co. as sales representative for A.C.F. valves in the northeastern territory, comprising New England, New York, and New Jersey, according to an announcement by John C. Coonley, manager, valve division.

Prior to coming to A.C.F., Hamill was associated with Homelite Corp., manufacturers of pumps, generators, and blowers.

Enterprise Brass Forms Oil Equipment Division

Enterprise Brass Works, of Muskegon, Mich., has established an oil equipment sales division, and is marketing a line of valves, fittings, and accessories for the oil industry.

E. B. W. products have been used over the past 50 years by original equipment manufacturers and now bring to the consuming market brass products from foundry to precision machining. Produced in a modern plant, including facilities for magnesium and aluminum permanent mold castings, E.B.W. products will be expanded in a program to include the development of additional products for the oil and allied industry.

Stewart Named as General Manager, Kaylo Division

The appointment of William J. Stewart as general manager of the Kaylo Division, Owens-Illinois Glass Co., has been announced by Carl R. Megowen, Owens-Illinois president.

Stewart succeeds J. Gordon King, who resigned recently to become vice president in charge of manufacturing for Plax Corp.

The Kaylo Division manufactures hydrous calcium silicate block insulation and pipe covering used where high temperature ranges are encountered as in the oil refining, chemical, and power industries. It is sold by Owens-Corning Fiberglas Corp.

The new division general manager joined the company in 1930 at the Charleston, W. Va., plant, and later supervised industrial engineering work there and at Owens-Illinois plants in Terre Haute and Gas City, Ind. His first assignment in the general offices, Toledo, was as a staff industrial engineer in 1939. He was transferred to the Charleston plant and returned to Toledo in 1945 as chief industrial engineer for the glass container division. Four years ago he was appointed chief industrial engineer in the administrative division, a position he will retain along with his new one.

Kentler Named Rockwell Meter, Valve Consultant

DR. KENTLER

Dr. Charles J. Kentler, Jr., manager of refinery and chemical sales for Rockwell Manufacturing Co., has been named technical consultant for the entire meter and valve division. The promotion has been announced by Gilbert T. Bowman, recently appointed manager, products department.

Dr. Kentler joined Rockwell in 1950 after 3 years as assistant plant manager of the chemical division of Wallace & Tiernan, Inc. Before that, he had spent 7 years as chemical and development engineer for Congoleum-Nairn, Inc., Associated Oil Co., and Tennessee-Eastman Corp.

A chemical engineering graduate of Yale University, he received his Ph.D. degree in chemical engineering from Cornell University.

Garber Is Director, Vice President of Alloy Wire

L. L. Garber, vice president, H. K. Porter Co., Inc., Pittsburgh, has been elected a director, vice president, and general manager of Alloy Metal Wire Co., Prospect Park, Pa., the newly acquired division of H. K. Porter Co., according to T. M. Evans, president.

In his new position with Alloy Metal Wire, a leading producer of stainless and alloy wire, rod, and strip, Garber will be in charge of all phases of the division's operations.

Garber, formerly general manager of Porter's Hinderliter Tool Co. Division,

has been with the company 4 years serving in various management and production capacities.

Midway Supply Purchases Midway Tool Co.

J. T. MURRAY

Joseph T. Murray, Jackson, Mich., supply man, has announced that his newly formed Midway Supply Co., which he heads as president, has purchased Midway Tool Co., Michigan's largest independent supplier of oil-field equipment.

Murray, who resigned in September as vice president of Utility & Industrial Supply Co., Jackson, after 16 years, completed the purchase with the estate of the late George Talbot, founder of Midway in 1932.

Midway Supply will maintain headquarters in Saginaw, Mich., present headquarters of Midway Tool. The change in ownership will not result in change in personnel of Midway Tool. John Gibson, long-time manager under Talbot, will continue as vice president and manager of Midway Supply. All store and field personnel will be retained. Midway has stores in Mount Pleasant, Sterling, and Winegars, Mich. Murray plans to expand the company's supply service throughout the oil fields of the United States and Canada.

Clifford, Benjamin Moved Up by Stone & Webster

George H. Clifford, president since 1929 of Stone & Webster Service Corp., was named chairman of the board, and R. N. Benjamin, vice president since 1948, was elected president of the business advisory service company at its recent directors' meeting.

Clifford has been associated with Stone & Webster interests ever since 1901. Benjamin has been engaged in corporate and financial work for Stone & Webster and its affiliates since 1927.

New Chart Firm Announced

Technical Charts, Inc., of Buffalo, has announced the formation of a special engineering staff to work with industry and instrument makers on recording-chart problems.

Technical has had a broad background in manufacturing all types of roll, dial, and rectangular charts. This new organizational group has its nucleus in men that specialize in handling the development of special charts for nonstandard instruments or unusual applications of standard instruments.

Schroeder Is Application Engineer For Warner

Arthur Schroeder has been named southeastern application engineer for Warner Electric Brake & Clutch Co., Beloit, Wis., it has been announced by Norman K. Anderson, manager of the firm's industrial division.

Schroeder, a graduate of Georgia Tech, will maintain offices at Brookhaven, Ga. He joined the Warner firm in 1952 after having been associated with The Texas Co. Schroeder will head up a program of direct engineering service to users of Warner industrial electric brakes and clutches throughout the Southeast.

St. Bonaventure Gets Grant From Bradford Chemical

Bradford Chemical Co., Bradford, Pa., manufacturers of bacteria and corrosion agents for the oil industry, announces the recent award of a research grant to St. Bonaventure University, St. Bonaventure, N. Y.

The grant, to be known as the Bradford Chemical Research Grant, is for a research project, designed to determine how bacteria become resistant to various bactericides, to be conducted by the department of biology at the university. The research is expected to lead to information that will make it possible to prevent the development of organisms that have become resistant to a bactericide or bactericides.

The project will be under the direction of Dr. Kenneth E. Anderson, chairman of the department of biology, and will be carried out by Frank Yackovich, a doctoral candidate in the department.

Marlow Assigns Bickert As Field Engineer

Marlow Pumps, of Ridgewood, N. J., manufacturers of self-priming centrifugal pumps, has announced the appointment of Maurice C. Bickert as district engineer. He will cover the four-state Mid-Atlantic district consisting of southern Pennsylvania, New Jersey, Delaware, and Maryland from headquarters in Ridgewood.

Bickert, who recently completed the Marlow training course, came to the company from Wallace & Tiernan where he was a sales engineer. Previous business experience was gained with Permutit Co.

WILDCAT COMPLETIONS

(Continued from page 144)

77 ft., 28/64-in. 40.2° gravity. TD 13,763 ft. (Oil discovery.)

McClain County: Blackwood & Nichols 1 Orisham, SE SE NW 18-6n-2w. Dry. TD 9,955 ft.

Okfuskee County: Russell B. Paterson 1 Sporleder, NE NE SW 10-12n-10e. IP 18,100 M.c.f. of gas per day, lower Dutcher 2,790-2,802 ft. TD 3,428 ft. (Gas discovery.)

Pontotoc County: Ketchum and Whan 1 Borders, SW NE SE 36-5n-8e. Dry. TD 5,942 ft.

Stephens County: Wm. H. Atkinson 1 Ketchum, SW SW NE 31-2s-4w. Dry. TD 1,219 ft. J. A. Maurer 1 Pace, SW SW NE 18-2s-6w. Dry. TD 3,612 ft.

KANSAS

Parton County: Honaker Drilling Co. 1 Esfeld, NE SW SE 21-19s-13w. IPP 318 BOPD, Arbuckle 3,441-45 ft. TD 3,488 ft. (Opens Great Bend Townsite pool.)

Barber County: Petroleum, Inc. 1 Bergner, SE SE SW 11-31s-11w. Dry. TD 4,993 ft.

Skelly Oil Co. 1 McClure, SW NW SW 31-32s-11w. Dry. TD 4,870 ft.

San Diego Oil Co. 1 Harbaugh, SE SE NE 33-33s-11w. IP 3,000 M.c.f. of gas per day. Mississippian 4,453-95 ft. TD 5,100 ft. (Gas discovery.)

Vickers Exploration, Ltd., 1 Schupbach, NW NW NW 16-35s-10w. Dry. TD 5,612 ft.

Ellis County: Transit Corp. 1 Norcross, SE SE NW 23-13s-20w. Dry. TD 3,906 ft.

Ellsworth County: Trans Era and Nate Appleman 1 Peterson, NW NW NW 36-17s-6w. Dry. TD 3,471 ft.

Greenwood County: Moro Oil Co. 4 McKenzie, SW SE NE 35-24s-12e. Dry. TD 1,720 ft.

D. V. Thompson 1 Rockhill, App. N½ NW NE 12-25s-10e. Dry. TD 1,814 ft.

Kingman County: M. B. Armer 1 Christopher, SW SW SW 36-28s-7w. Dry. TD 4,465 ft.

McPherson County: Anschutz Drilling Co. 1 Holloway, NW NW SW 14-20s-4w. IPP 141 BOPD, Viola 3,719-25 ft. TD 3,725 ft. (Oil discovery.)

Ness County: Sohio, Armer, Appleman 1 Herman, NW NW SE 36-18s-24w. Dry. TD 4,750 ft.

Norton County: Barnett 1 Legg, SE SE SE 32-2s-24w. Dry. TD 3,672 ft.

Pawnee County: GMR 1 Dufford "A," SE SE SE 7-21s-15w. IP 5,000 M.c.f. of gas per day, Arbuckle 3,809-22 ft. TD 3,878 ft. (Gas discovery.)

Glen Nye 1 Bordewick, NW NW SW 9-22s-16w. Dry. TD 3,910 ft.

Pratt County: Lion Oil Co. and Musgrove 1 Holland "B," NE SE NW 5-26s-12w. Dry. TD 4,330 ft.

Rooks County: E. R. Cave 1 Probst, SW NW NE 18-6s-19w. Dry. TD 3,613 ft.

Aurora Gas and Prime Drilling Co. 1 Mayhew, SE SE SE 1-10s-19w. Dry. TD 3,850 ft.

Derby Oil Co. 1 Berland, NE NE SW 20-10s-19w. IPP 27 BOPD, Arbuckle 3,778-82 ft. TD 3,782 ft. (Oil discovery of Berland East pool.)

Sumner County: E. H. Adair 1 Pearce, SE SE SE 34-32s-4w. Dry. TD 4,317 ft.

NEBRASKA

Cheyenne County, Fleming pool: Ohio Oil Co. 1 Fleming, NE NE NW 28-13n-50w. Pumped 84 BO, 5 per cent water, 24 hours, TD 5,005 ft. PB 4,989 ft. "D" sand discovery—new field.

Engelland area: Ohio Oil Co. 1 Engelland, SE NW SE 33-15n-49w. Pumped 250 BOPD, "D" sand discovery—new field.

TD 4,755 ft. PB 4,605 ft. "J" sand 4,677 ft. (?).

Kimball County: Wytex Oil Co. 1 Goranson, NE NE NW 14-15n-55w. Dry. Skull Creek 6,205 ft. TD 6,210 ft.

Sioux County: Gulf Oil Corp. 1 Olbright, SW SW NW 33-30n-53w. Dry. TD 4,648 ft. Sundance 4,595 ft.

EASTERN NEBRASKA

Richardson County: Sandrock Oil Co. 9 Sandrock, SE SE NW 20-1n-16e. Dry. TD 2,921 ft.

CALIFORNIA

Colusa County: R. S. Rheem, Operator 1 Southam, NE SW 25-18n-2w, IP 1,500 M.c.f. ¾-in. choke, perfs. 2,215-2,230 ft., TD 5,064 ft. (New field discovery in Princeton area.)

Kern County: Casner & Bentz & Beshara 1 Karpe, 29-31s-28e. Dry. TD 5,000 ft.

Intex Oil Co. 1 Connell-U. S. L., 12-26s-27e. Dry. Vedder 2,221 ft., TD 2,277 ft.

Pacific Western Oil Corp. 25 Derby, 25-31s-29e. Dry. TD 6,908 ft.

E. A. Parkford 56-12 M. & T., 12-29s-29e. Dry. TD 3,578 ft.

Richfield Oil Corp. 27-20 San Emidio-A, SW SW 20-11n-22w, IPF 408 BOPD, 24/64-in. choke, 24° gravity, perfs. 6,488-6,657 ft. in Reef Ridge sand, TD 7,246 ft. (New deeper Miocene sand in Los Lobos field.)

Richfield Oil Corp. 36-32 Goyner-U. S. L., 32-32s-23e. Dry. TD 3,525 ft.

C. W. Teater 1 Teater-Billington, NE SW 19-29s-27e, IPF 173 BFPD, 32 per cent cut, 19° gravity, perfs. 4,290-4,343 ft., TD 4,399 ft. (New field discovery, Greenacres, in Rosedale area.)

Kings County: Continental Oil Co. 1 Conoco-Hancock-Westlake Unit, 32-22s-20e. Dry. TD 3,801 ft.

Gene Reid Drilling, Inc. 3 Avenal, 35-23s-17e. Dry. TD 1,246 ft.

Los Angeles County: The Texas Co. 4 Newhall-A, 15-4n-16w. Dry. TD 2,005 ft.

Monterey County: Hames Valley Dev. Co. 1 Peri, 30-23s-10e. Dry. TD 800 ft.

Orange County: Seaboard Oil Co. 1 Thorpe, 24-6s-11w. Dry. TD 7,622 ft.

San Benito County: The Texas Co. 2-B O'Connell, 2-12s-4e. Dry. TD 2,594 ft.

Santa Barbara County: Richfield Oil Corp. 88-10 Russell-A, 10-10n-27w. Dry. TD 6,060 ft.

Stanislaus County: Standard Oil Co. of California 1 Young Community, 34-3s-8e. Dry. TD 13,683 ft.

Tulare County: A. J. McGreevy 1 "Well," SE SE 22-22s-27e, IPF 60 BOPD, 16.5° gravity, perfs. 738-914 ft., TD 988 ft. (New field discovery in Porterville area.)

MONTANA

Roosevelt County, E. Poplar area: Brooks & Sullivan 1 Government, C NW SE 8-29n-51e. Dry. TD 5,987 ft.

WYOMING

Campbell County, Dellinger Prospect: The Texas Co. 1 Radlbeck, C SE NW 18-47n-59w. Dry. TD 8,169 ft. Lakota 8,090 ft.

Crook County: Ralph Gardner 1 Kinsey, SE SW SW 23-49n-67w. Temp. suspended. TD 1,710 ft.

Hot Springs County, Chimney Rock: J. Ray McDermott & Co. Hiawatha Oil & Gas 1 Unit, SE NE SE 21-44n-100w. Dry. TD 6,136 ft. Madison 6,075 ft.

Johnson County, Dugout Creek: Earl Mallette 1 Government, SE SW 33-43n-80w. IP 150 BOPD, Shannon discovery—new field. TD 1,803 ft.

Laramie County, Chugwater area: Ankarlo & Ellis 1 Att., SE SE 6-19n-66w. Completed as water well. TD 525 ft. Pierre 500 ft.

Niobrara County: Simmons & Keller 1 A. Joe, SE SW SE 30-39n-61w. Dry. TD 2,758 ft. Lakota sand 2,705 ft.

Pine Lodge: Crusader Corp. 1 Government Hanson, NW SE SE 4-35n-63w. Dry. TD 1,415 ft. Fuson 1,410 ft.

Platte County: J. J. Welsh 1 Welsh, NE NW NE 6-28n-65w. Dry. TD 2,310 ft.

Washakie County, E. Wyman Draw: J. Ray McDermott 1 Government, SW SW NE 31-46n-89w. Dry. TD 8,147 ft. Tensleep 8,103 ft.

Weston County: Rocket Drilling Co. 1 Government, SW SW NE 17-41n-65w. Dry. TD 7,035 ft. Dakota sand 6,992 ft.

W. Mush Creek: L. York 1 J. Everett Statler, C SE NW 5-43n-64w. Suspended. TD 5,670 ft. Newcastle pay 5,610-23 ft.

COLORADO

El Paso County: Justheim Petroleum 1 Asper, SE SE SE 21-11s-60w. Dry. TD 6,872 ft. Dakota 6,490 ft.

The New 7-Falls County 1 A. G. Hill, SE SW NW 26-13s-67w. Temporarily abandoned. 3,243 ft.

Garfield County, Carbonera: Forest Oil Corp. 1 Government, NE NW NE 2-7s-104w. Dry. TD 5,745 ft. Entrada 4,646 ft.

Logan County: Don Rounds 1 John Walek, NW NW NW 8-7n-54w. Dry. TD 4,347 ft. Skull Creek 5,332 ft.

Morgan County: Denver Basin 2 State, SW SW SW 2-1n-56w. Dry. TD 5,351 ft. Skull Creek 5,315 ft.

Routt County, Fish Creek: O. D. Robinson 1 Robert Kagie, C SE SW 29-4n-87w. Dry in granite TD 4,795 ft.

Fish Creek: O. D. Robinson 2 Robert Kagie, SE NE SE 30-4n-87w. Dry. TD 1,920 ft.

Washington County: Bill Tomberlin 1 Stites, SE SE SE 17-1s-56w. Dry. TD 5,436 ft. "J" sand 5,244 ft.

Weld County: Sherrod & Apperson 1 Rensick, C SW NE 27-9n-62w. Dry. Lyons 8,667 ft. TD 8,747 ft.

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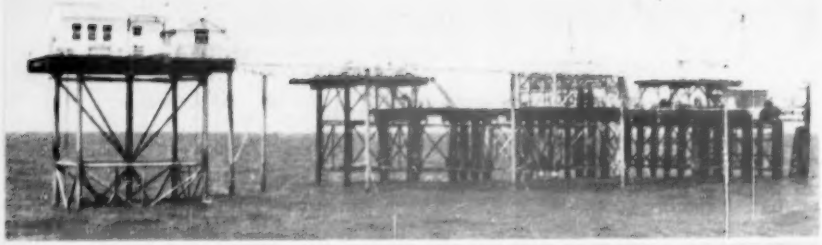
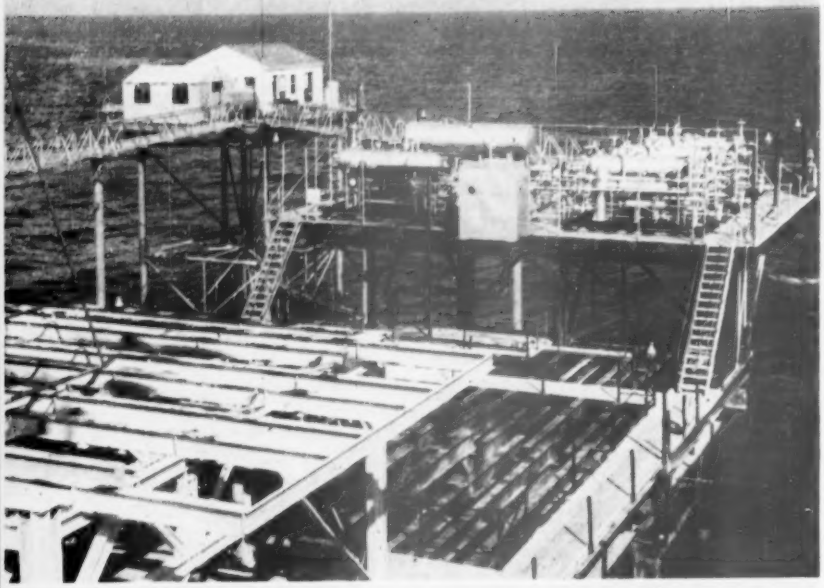
LEGAL

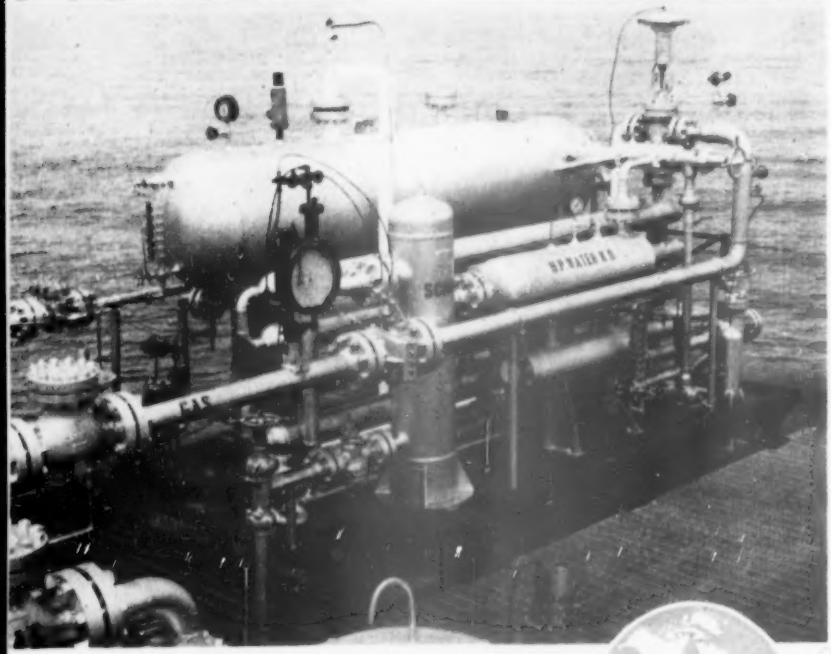
Notice is hereby given that sealed bids for oil and gas leases on approximately 20,803.76 acres of Tribal and Allotted restricted Indian lands in Roosevelt and Valley Counties on the Fort Peck Indian Reservation, State of Montana, will be opened at 2:00 o'clock P.M., Mountain Standard Time, January 12, 1954, at the Fort Peck Indian Agency, Poplar, Montana. Those individuals desiring specific information in connection with this sale may contact the Superintendent, Fort Peck Indian Agency, Poplar, Montana, or telephone Poplar 2181.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 120 acres of public domain land will be offered in two parcels for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1 p.m., E.S.T., January 20, 1954, when bids will be opened. These lands consist of Parcel #1: NE¼SE¼, sec. 10, T. 20 N., R. 2 E., Louisiana Meridian, Monroe Gas field, 40 acres more or less; Parcel #2: E½NE¼, sec. 10, T. 21 N., R. 15 W., Louisiana Meridian, Pine Island field, undefined, 80 acres more or less. Details of the lease offering and how and where to submit bids may be obtained upon request from this office. L. E. Hoffman, Chief, Division of Minerals.







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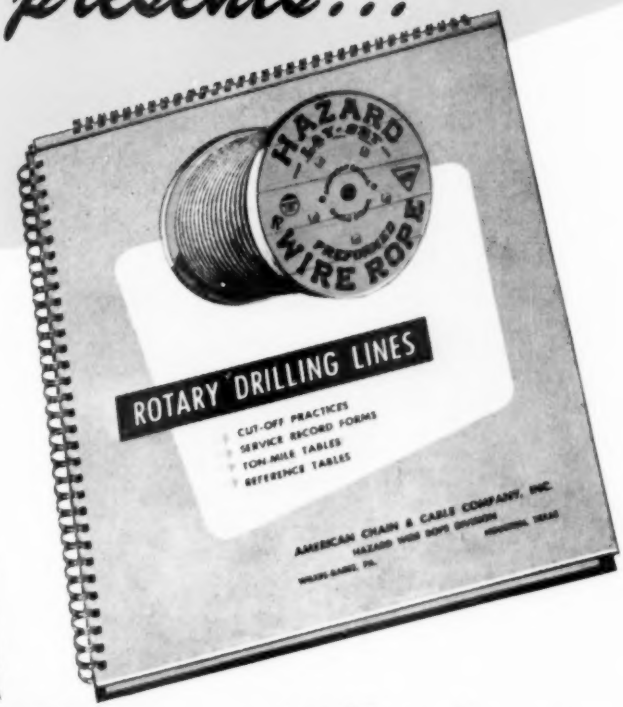

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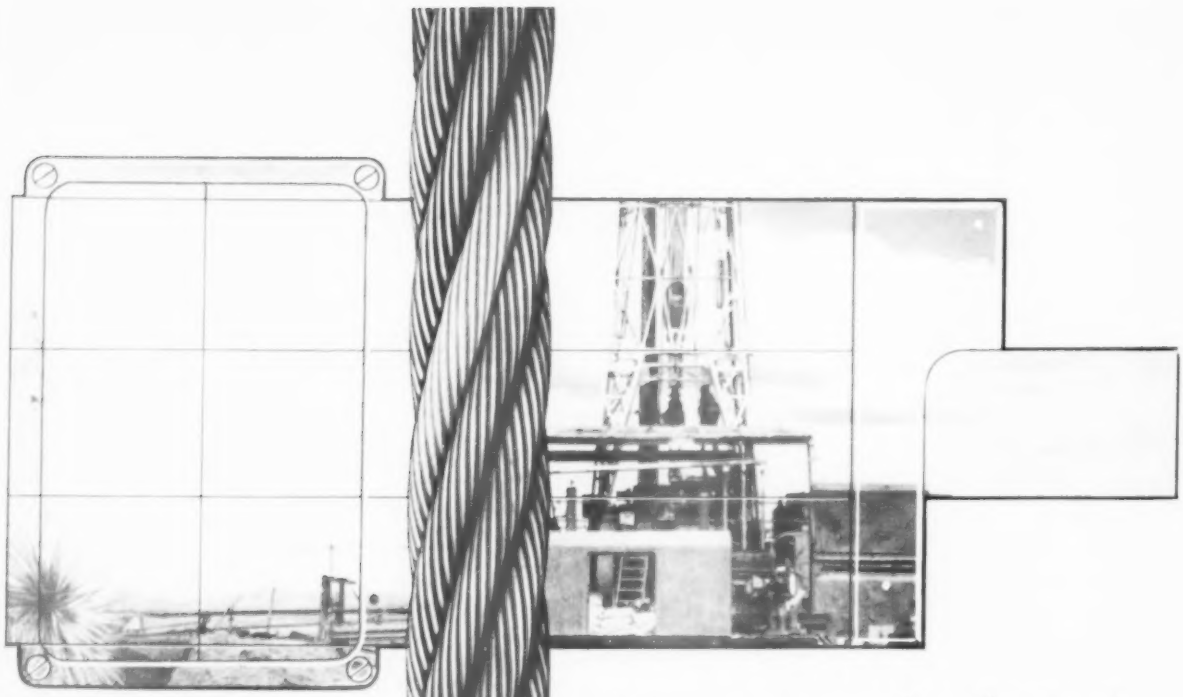

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